

When Flagships Falter: Comparing BlackBerry and Nokia

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In recent decades, Waterloo¹ and Finland have been hailed as high tech success stories, leapfrogging competitors to assume leadership in information and communication technology markets. Flagship firms, BlackBerry² and Nokia, were central to this process. In addition to generating employment and tax revenue, the two firms popularized innovation-based competition, inspired local entrepreneurs, attracted international investment, and diffused knowledge throughout the local economy (Dahlman et al. 2006; Gillmor 2012; Moen and Lilja 2005). In fact, the two regions could be viewed as a model of how to succeed in high-technology markets, as evidenced by the interest in creating “new BlackBerries” and “new Nokias” (Ornston 2018; Yakabuski 2013).

But Finland and Waterloo also represent a cautionary tale, as their dependence on flagship firms increased their vulnerability to disruptive economic shocks. When BlackBerry and Nokia faltered between 2009 and 2013, they threatened to take their local, ICT industries down with them. In the end, it appears that their decline was not a death sentence. Both Finland and Waterloo have benefited from a proliferation of new, startups (Best 2014; Dingman 2015). In the long-run, this may result in a healthier, more sustainable high-technology ecosystem. But the transition has been a rocky one, particularly for Finland, where startups have yet to approach Nokia in employment or revenue (Pajarinen and Rouvinen 2015). Nokia’s decline transformed Finland into one of the worst-performing countries in the Eurozone after 2008 (Eurostat 2016). By contrast, Waterloo’s star has dimmed only slightly in the wake of BlackBerry’s decline and the

¹In this paper, Waterloo refers to the Regional Municipality of Waterloo, a region of roughly 500,000 which encompasses the city of Waterloo, Kitchener, Cambridge and surrounding townships.

²Formerly Research in Motion. For simplicity, I use the name BlackBerry throughout the paper, even when referring to developments before the corporation’s 2013 rebranding.

region's ICT industry is arguably stronger than it was during Blackberry's peak (CBRE 2016).

Why was Waterloo so much more resilient to the decline of its flagship firm than Finland? This paper attributes the divergence not to the differences between BlackBerry and Nokia, which were insignificant, but rather the way in which these flagship firms were embedded within their local community. While BlackBerry loomed large within the Waterloo region, it attracted few public resources and maintained a relatively aloof relationship with local technology firms. By contrast, Nokia dominated the Finnish policymaking process and was tightly connected to the rest of the local ICT ecosystem. Efforts to embed Nokia within a regional innovation system should have and did deliver significant benefits, but they also increased Finland's vulnerability to disruptive economic shocks. By contrast, Waterloo's failure to more fully engage BlackBerry resulted in a more diverse ecosystem which was relatively unaffected by the firm's decline. These two case studies suggest that while integrating enterprises within the local community can deliver significant benefits, the act of embedding large, flagship firms is also fraught with risk.

The Promise and Perils of Embedding Flagship Firms

The perils of integration are not immediately obvious. The literature on economic sociology, political economy, economic development, urban studies and regional innovation systems consistently highlights the benefits of "embedding" firms within a dense network of local relationships (Evans 1995; Lundvall 1992; O'Riain 2004; Saxenian 1994). "Embedding" can take several forms. First, enterprises can be integrated into the policymaking process, steering the allocation of public resources or assuming

responsibility for policy implementation (Hall and Soskice 2001; Schienstock and Hämäläinen 2001). Second, those of a more liberal persuasion might privilege voluntary ties within the private sector. Market competition may encourage firms to strike long-term partnerships with component suppliers, service providers, and end users (Porter 1990). Finally, economic sociologists would argue that both patterns of integration rely on cultural embedding in which enterprises are connected to their surrounding community by shared norms or values (Lundvall 1992; Walshok and Shragge 2014).

All three perspectives suggest that embedding can benefit firms by lowering costs, reducing risk, and resolving collective action programs. For example, private-public collaboration in education could deliver to a steady supply of affordable, high-quality human capital (Barry 2004). A large supplier network can lower costs by facilitating specialization and reduce vulnerability to economic downturns by lowering capital costs (Steinbock 2000). Finally, communication among firms, suppliers, end users, and the public sector can foster innovation, providing the enterprise with a competitive advantage over its rivals (Lundvall 1992).

More importantly for the purposes of this essay, embedding also benefits host communities. First, communities can reduce the risk of capital flight by connecting enterprises to local resources. Reliance on regional educational institutions, local research, specialized suppliers, and supporting services increases the opportunity cost of relocation (Zheng and Warner 2010). To the extent that communication among firms, governments, and civic organizations fosters innovation, it further inoculates communities from cost competition by enabling firms to compete on the basis of novelty or quality (Storper and Venables 2004).

Once firms are anchored within the community, local stakeholders can extract concessions such as higher wages or taxes. These concessions not only ensure that the benefits of growth are widely distributed, they also enable communities to upgrade investments in knowledge, human capital, infrastructure, and supporting services (Weisskoff and Wolf 1977). Often, as the cases of BlackBerry and Nokia illustrate, enterprises value these collective goods and deliver these benefits voluntarily. Firms often independently raise wages, fund local universities, or contribute to community development without any external pressure. Among these collective goods, knowledge spillovers deserve special mention. Not only are embedded enterprises more likely to innovate for reasons mentioned above, but these productivity-enhancing insights are more likely to reach other enterprises, either deliberately or unwittingly, when connected by dense networks (Lundvall 1992).³

The benefits of embedding are particularly stark when juxtaposed to an independent enterprise with few ties to the local community. In these “enclave economies” (Singer 1950), knowledge is internalized within the firm or redirected outside of the community. These corporations are less likely to reinvest profits locally, more sensitive to cost competition, and more likely to respond with capital flight. As a result, embedding is widely portrayed as best practice in literatures on FDI promotion, innovation policy, and urban development.

The benefits of integration appear particularly lucrative when they anchor large, “flagship” firms, such as BlackBerry or Nokia. In addition to their direct impact on employment, large enterprises are generally more productive than their smaller

³ Assuming local enterprises possess the absorptive capacity to process and exploit this knowledge.

counterparts (Van Ark and Monnikhof 1996). These high-productivity firms can in turn upgrade the capacity of their local partners, or knowledge may diffuse through spinoffs or labor market mobility (Maliranta 2000: 69; Paija 2000). Flagship enterprises also operate at a scale that enables them to contribute to collective goods such as infrastructure, human capital, knowledge creation, and even community development. To cite one example from Waterloo,

The thing that I miss the most about [BlackBerry] is its impact on the community broadly defined. So you could go to [BlackBerry] and say we're building "X," a new library or a new facility Regional governments could call on [BlackBerry] to do stuff behind the scenes, to bring a regional airline to the airport Or United Way is struggling and [BlackBerry] could do a top up. That's one thing we miss, there's no big company that has come in and can take care of the community in that way. You may have the same number of people employed and the same economic activity, but you don't have that anchor (Interview with former venture capitalist, 23 November, 2017, Waterloo, Canada).

In the case of Finland and Waterloo, flagship enterprises established a regional reputation. By placing these regions "on the map" as high-technology hubs, BlackBerry and Nokia gave other, high-technology enterprises greater credibility in approaching investors and clients (Gillmor 2012; Steinbock 2000).

While the benefits of embedding are formidable, integration into the local community is not unambiguously positive. In a 1993 study, Gernot Grabher illustrates how strong ties within the German steel industry increased the Ruhr region's vulnerability to disruptive economic shocks through functional, political, and cognitive lock-in (Grabher 1993). This paper hypothesizes that these risks are especially pronounced for flagship firms. Large enterprises are more likely than their small and medium-sized enterprises to contribute to functional lock-in by integrating local enterprises into a single supplier

network. Very large firms are more likely to capture the policymaking process, reorienting public resources around their strategic goals. Finally, these enterprises are more likely to dominate the public consciousness, contributing to cognitive lock-in. If correct, this hypothesis suggests a more nuanced understanding of industrial embedding and flagship firms. While efforts to integrate enterprises into the local community can deliver significant benefits, the integration of very large firms is fraught with peril. By the same token, regions may prove surprisingly resilient to the decline of a flagship firm when it is not well-connected to the local community.

When Flagships Falter: Comparing Finland and Waterloo

To test this hypothesis, this paper compares the rise and fall of two flagship firms, BlackBerry and Nokia, using a most similar systems research design. Both BlackBerry and Nokia entered mobile communications during the 1990s, relying on mobile devices to successfully navigate the dot com crash at the turn of the millennium. At their height in 2008, Nokia was responsible for 40% of global smart phone sales and BlackBerry commanded a 20% market share (Gartner 2009; Pajarinen and Rouvinen 2013; Sher 2013). Within a decade, both enterprises had shed three quarters of their workforce, retreating to more specialized niches such as embedded security (BlackBerry) and network equipment (Nokia) (Pender 2015; YLE 2016).

Both BlackBerry and Nokia dominated their local communities. During the 1970s, Waterloo and Finland relied principally continental European-style, medium-technology engineering. While Finland was more dependent on natural resources and Waterloo was a center for insurance, neither region was characterized by meaningful ICT production. High-

technology enterprises such as Watcom (Waterloo) or Waisala (Finland) were the exception rather than the rule (Munro and Bathelt 2014: 221). In this context, it is no exaggeration to suggest that BlackBerry and Nokia singlehandedly propelled their regions into high-technology markets. Nokia's role as a "giant" in the Finnish innovation ecosystem is well established (Ali-Yrkkö and Hermans 2004). In 2008, Nokia's 23,000 domestic employees represented roughly 20% of the Finnish ICT sector (Pajarinen and Rouvinen 2015). A journalist summarized,

The role of Nokia in the Finnish business community was paramount. The CEOs of Nokia were very prominent figures. They were the first among equals, so that Nokia had a big say in the kind of, what the business community wanted, Nokia's word weighed more than others. Then when the crash came and Finland was on its knees and it a question of whether it would be taken over by the IMF and there was no light in the tunnel and suddenly you had this emerging kind of business in Nokia Technology and innovation that were pushed to help Nokia as much a possible so you could say certainly it became a national project (Interview with journalist 19 June 2012, Finland).

BlackBerry's stature was similar. While it employed only 11,000 at its peak in 2011 (Pender 2015), this represented a third (Lu 2013) to a half (CBRE 2016) of ICT employment in a significantly smaller region. Even by national standards, it was a formidable force. In the words of one former high-technology executive, "BlackBerry was absolutely the dominant factor not only in this ecosystem, but also the country. At one point it had the largest market cap, more so than any of the incumbents, including the banks. One cannot understate the tremendous impact BlackBerry had," (Interview with former executive, technology firm, 29 November 2017, Waterloo). The structural composition of employment at the two enterprises was also similar, with professional

services such as research and development superseding, but not fully replacing, manufacturing after the dot com crash (Ali-Yrkkö 2010: 32; Yakabuski 2009).

By the same token, their decline represented an existential threat to both communities after 2008. Nokia reduced Finnish employment from 23,000 to 6,000 by 2016, while BlackBerry shrank its workforce by a similar proportion, from 11,000 to 2,700. Here, however, the fates of Waterloo and Finland diverge. While BlackBerry's decline was perceived as a clear crisis (Interview with local politician, Waterloo region, 28 November 2017), unemployment *fell* and real estate prices increased after 2011 (CBRE 2014; Roose 2015). In the words of a local venture capitalist, "In Toronto, when BlackBerry declined everyone assumed Waterloo was dead ... But BlackBerry failed and what happened? House prices declined for maybe a day and a half and then climbed onward" (Interview with venture capitalist, 22 November 2017, Waterloo, Canada). Today, industry representatives complain of a labor market *shortage* with 2,500 unfilled openings (Interview with representative, Communitech, 1 December 2017, Waterloo). Resilience was based in part on the establishment of 1,845 new technology firms established between 2009 and 2014 (Dingman 2015). Between 2010 and 2015, Communitech was supporting an average of 400 startups a year (Pender 2017).⁴ Estimates vary, but by 2016 Waterloo hosted the fastest-growing technology industry in Canada and ICT employment had *surpassed* its peak under BlackBerry (CBRE 2016). In the words of one journalist,

I don't like to talk in absolutes, but [the impact was] close to zero as you can without being absolute about it. There's no shortage of new startups ... When BlackBerry sold off the real estate, there was 2.7 million square feet of space, the commercial real estate sector was apoplectic. They thought

⁴ To put this figure in perspective, Tekes, with a larger budget and broader mandate, and serving a regional economy of five million, supported only 600 startups in 2015 (Interview with director, Tekes, 9 June 2016)

we'd be in a sinking market for ten years. Instead everyone has been pleasantly shocked that in a little over ten months they leased up more than two million square feet of that 2.7 million, largely by startups (Interview with journalist, 15 March 2016, Waterloo, Canada).

In Finland, by contrast, ICT employment fell by more than 10% in the four years following Nokia's decline (Pajarinen and Rouvinen 2015: 96).⁵ R&D expenditure, ICT value-added, and ICT exports have all plummeted following Nokia's decline (Ali-Yrkkö et al. 2015). In contrast to Waterloo, Nokia's struggles transformed Finland from a model pupil into the "sick man" of Europe (Khan 2015) and one of the worst-performing countries in the Eurozone (Eurostat 2016). Nokia, which had contributed heavily to GDP growth during the late 1990s and early 2000s, was singlehandedly responsible for approximately a third of the decline in national output (Pajarinen and Rouvinen 2013: 3).

Nokia's decline was not an unmitigated disaster. The firm's struggles inspired a wave of entrepreneurial activity, as well as a much-needed reorientation of Finnish innovation policy (Ornston 2018). In this sense, the Finnish ICT industry has proven resilient to the decline of its flagship firm. But the Finnish start-up scene comes with caveats. Employment gains remain modest. Gaming, which by all accounts has propelled the "new" ICT industry, employed only 2,750 in 2016. These firms are enterprises productive, but other "technology startups" disguise relatively low-productivity, part-time, one-person consulting operations (Interview with economist, 17 June 2016, Finland). As a result, whereas observers in Waterloo marvel at the resilience of their ICT ecosystem, their Finnish counterparts often describe a booming startup scene in more cautious terms,

⁵ The decline sounds modest but is actually quite striking because it occurred against the backdrop of a long-term, secular increase in the demand for ICT-related goods and services (Interview with economist, 17 June 2016, Finland)

expressing doubts about its maturity and sustainability. One ICT consultant glumly concluded, “Of course, from a venture capitalist point of view, there are more opportunities to invest. So I absolutely agree that situation is better number-wise than it was ten years ago. But the numbers are still very small. If you think about the gaming industry there are about 150 firms.” (Interview with consultant, 15 June 2016, Finland). Observers praised the quality of Finland’s human capital, but in contrast to Waterloo, no one identified labor market *shortages* as a binding constraint (Interview with former policymaker, 7 June 2016, Tekes director 9 June 2016 and economist 17 June 2016). The Finnish ICT industry may emerge from the crisis stronger than ever, but the transition has clearly been much rockier.

Why Waterloo Flourished While Finland Struggled: Conventional Explanations

The reasons for Waterloo’s resilience are not immediately obvious. The region should have been *more* vulnerable to BlackBerry’s troubles as the enterprise represented a higher share of ICT and aggregate employment than Nokia ever did in Finland. Nor can these divergent outcomes be attributed to the internal character of the two firms. As noted above, both offered similar products in the same industry and both were disrupted by the same platforms, Apple and, more importantly, Android. Whereas some flagship firms, such as IBM or Novo Nordisk, have a reputation for strengthening regional economies by encouraging entrepreneurship, both BlackBerry and Nokia resembled closed shops. Spinoffs existed, from Benefon in Finland to Well.ca in Waterloo, but they were few and far between before 2010 and even more rarely supported by their parent company. The response, “Spinoffs? Not out of [BlackBerry]. The answer is no, I’d be hard pressed to come up with one” (Interview with journalist, 15 March 2016, Waterloo) was typical in both

regions. Concerns about intellectual property, but also generous remuneration and the prestige of working for a global leader appeared to discouraged employee entrepreneurship in both companies (Interviews with executive officer, Nokia, 24 November 2006, Finland, professor, 7 June 2012, Finland, venture capitalist, 8 June 2012, Finland, journalist, 15 March 2016, Waterloo, former venture capitalist, 23 November 2017, Waterloo,).

Since BlackBerry and Nokia were so similar, we could instead turn to regional differences to explain these different outcomes. Interviewees in Waterloo were quick to point to their diversified economy, and the insurance industry in particular, as a source of strength (Interview with local policymaker, 29 November 2017, Waterloo, Canada). Finland, by contrast, historically relied on natural resources, most notably forestry. Both regions, however, exhibited strength in metal processing and advanced manufacturing (Munro and Bathelt 2014; Paija and Palmberg 2006). More importantly, if Waterloo's economic performance was driven by insurance, manufacturing, and other industries, we would expect high-technology employment to shrink as employees fled to other sectors. ICT employment, however, *increased*. Conversely, we would expect more Finns to turn to entrepreneurship if traditional industries were foundering. Instead, the opposite occurred.

The differences between Finland and Waterloo could reflect the fact that the former is a nation-state, whereas the latter is a region. While regional developments in Espoo, Oulu, and Salo paralleled national trends, perhaps Waterloo benefited from a more mobile labor market or countercyclical spending by provincial and federal authorities. There is no question that neighboring municipalities such as Toronto absorbed some former BlackBerry workers. But the fact that ICT employment has *grown* suggests that Waterloo

did not adapt by shedding high-skill labor (CBRE 2016). Moreover, with this healthy labor market, Waterloo was hardly a target for countercyclical spending. Nor did the federal or provincial government orchestrate a bailout of BlackBerry, relying on existing retraining and advisory schemes to reallocate labor (Interviews with regional executive and local policymaker, 29 November 2017, Waterloo, Canada). If anything, Finnish policymakers were more active in this space following the collapse of Nokia (Interview with former incubator director, 23 November 2017, Waterloo).

Perhaps microeconomic differences played a critical role, most notably the fact that Waterloo was situated within a liberal market economy, whereas Finland relied on strategic coordination. I revisit this point in the conclusion, but a first cut suggests that the two regions were not as different. High-technology enterprises in Finland did not view labor market regulation or other forms of strategic coordination as a significant impediment to entrepreneurship, partly because Finland successfully adapted its institutions to promote radical product innovation in the 1990s (Ornston 2012) and partly because entrepreneurs could circumvent onerous restrictions in a lightly unionized sector by striking atypical contracts with their employees and industry partners (Herrmann 2009; Lange 2009). Both Finland and Waterloo benefited from low interest rates and abundant venture capital after 2009, albeit at far lower levels than US regions such as Silicon Valley (FVCA 2016; Pender 2014). Instead, Finnish and Canadian entrepreneurs alike emphasized strikingly similar challenges, especially their peripheral location as it relates to accessing customers and senior-level managerial talent (Interviews with representative, forest association, 11 October 2005, Finland, director, venture capital fund, 22 November 2006, director, venture capital fund 23 November, 2006, Finland, representative, Chamber of

Commerce, 15 March 2016, Waterloo, executive, high-technology firm, 23 November 2017, Waterloo, and former director, venture capital fund, 23 November, 2017). In short, the similarities between the two regions are more striking than the differences.

To this point, patterns of high-technology entrepreneurship were strikingly similar before 2008. Despite Waterloo's position within a liberal market economy and its recent status as a high-technology hub, start-up activity was modest before 2008 (Interviews with executive, high-technology firm, 23 November 2017, former partner, venture capital fund, 23 November, 2017, and executive, high-technology firm, 28 November 2017, and former CEO, 29 November 2017, Waterloo). In the words of one University of Waterloo alumnus, "I went to school here in the early 1990s and entrepreneurship was something you did if you couldn't find a job when you graduated. It wasn't high on the aspiration list ... It wasn't talked about or celebrated the way that it is today" (Interview with employee, incubator, 24 November 2017). The region boasted several dozen moderately successful, high-technology startups such as Descartes, Maple, Open Text, Desire 2 Learn, Pixstream, and Sandvine. During the 1980s and 1990s But the same could be said of Finland, which produced Benefon, Elekkrobit, F-Secure, IOBox, Martis, SSH Communications, Net Hawk, and Tecnoman at the same time. In light of these institutional and historic similarities, it is difficult to conclude that Waterloo was fundamentally more receptive to high-technology entrepreneurship than Finland.

To understand why the two regions diverged, we must instead look beyond BlackBerry, Nokia, Waterloo, and Finland to the relationship between them. Following the theoretical framework articulated above, I examine the degree to which these two flagships were incorporated into the *policymaking* process, integrated within *industrial* networks

and *culturally* embedded within their local societies. While both enterprises dominated their respective communities, I demonstrate that Nokia was more embedded than BlackBerry. It contributed significantly more to the ICT innovation ecosystem, but simultaneously increased Finland's vulnerability to disruptive economic shocks.

Embedding Flagship Firms: BlackBerry and Nokia

Nokia represents the archetypical example of an embedded enterprise. Nokia was *politically* central since CEO Kari Kairamo used his position as chairman of the Confederation of Finnish Employers to lobby for new innovation policies in the 1980s (Moen and Lilja 2005: 372). By the 1990s, the firm enjoyed direct representation within the influential Science and Policy Technology Council and on other bodies, such as the board of the Finnish Funding Agency for Technology and Innovation (Tekes). In the words of one former employee,

When I was working at Nokia the industry associations, the Federation of Technology Industries and even the Finnish government would approach us and ask "What is the next thing that we need to do?" And I thought, "Why are you asking me? Shouldn't you have a plan of your own?" (Interview with former employee, Nokia, 14 June 2016, Finland)

Nokia's influence was most conspicuous in education, where the firm not only vacuumed up human capital (Interviews with venture capitalist 8 June 2016 and software industry representative 10 June 2016, Finland), but also directly influenced university and polytechnic output. Nokia's demands drove the decision to double university intake and triple polytechnic intake during the 1990s (Dahlman 2006: 102). Not coincidentally, educational expansion focused on engineering, and ICT in particular. By the turn of the

millennium, Finland ranked second only to South Korea in the share of engineers (OECD 2003).

Nokia's influence extended to myriad other policy domains, from capital taxation (Pelkonen 2008: 407) to immigration (Bärlund and Brewis 2013: 21), data privacy (Lee 2009) and innovation policy (Ornston 2018). Focusing on the latter, the firm received 175 million Euro in R&D funding from Tekes alone between 1995 and 2008. In addition to dwarfing Canadian support for BlackBerry, this funding was used to support private-public and inter-firm collaboration. Between 1995 and 2008, Nokia participated in no fewer than 375 separate Tekes projects (Ali-Yrkkö 2010: 26-27), often situating itself at the center of these consortia (Paija and Palmberg 2006: 78). Former employees make it clear that by the mid-1990s the goal was not public funding, which was heavily regulated by the EU and paled in comparison to Nokia's corporate R&D budget. Rather, Nokia used Finnish innovation policies to monitor technological developments and mobilize actors around its strategic vision (Ornston 2012: 83).

For example, Finland ranked highest in the OECD in measures of industry-university cooperation by the turn of the millennium (Koski et al. 2006: 50). Nokia, not surprisingly, dominated these tight-knit relationships. Nokia employees and academics alike were quick to describe cooperation in various projects, from engineering a software protocol for the GSM mobile standard to the psychology of user-friendly design (Interviews with professor, 27 September 2005, former professor and Nokia employee, 17 October 2005, and professor, 8 November 2005, Finland). My own early research on political science was supported by Nokia, among other sources.

Nokia used these public policies to embed itself *economically*. Tekes-funded research consortia, as well as Nokia's own deep pockets, enabled it to construct a sprawling network of three hundred first-tier, Finnish suppliers (Ali-Yrkkö and Hermans 2004: 113). By the late 1990s, this cluster employed almost as many Finns (14,000) as Nokia itself (21,000) (Paija 2000: 4). While most manufacturing sub-contractors moved abroad after the dot com crash, Nokia continued to rely heavily on Finnish enterprises in software development until the firm's collapse (Interview with former executive, 24 November 2006, Finland). Both manufacturing and software sub-contracting included research, as Nokia aimed to externalize one-third of its R&D (Interview with executive, non-telecommunications firm, 24 October 2005, Finland). The connections between these companies were so strong that foreign enterprises aspiring to penetrate Nokia's supplier network acquired Finnish sub-contractors. The key attraction was not their technology or skills, but rather their close personal relationships with Nokia employees (Interview with policymaker, 11 November 2005, Finland).

As a result of its dominant position in politics and economics, Nokia was also *culturally* embedded. As noted above, Kari Kairamo used the Confederation of Finnish Employers and informal roundtables to transform employer attitudes toward technological innovation during the 1980s (Moen and Lilja 2005: 372). In the 1990s, Nokia was a role model for aspiring entrepreneurs, even those unconnected to the enterprise. It is easy to understand why as the Finnish press consistently lionized the firm. Journalists likened Nokia to classic icons of Finnishness such as the hoe, the marsh, and a spirit of *sisu* or determination (Linden 2012: 243). Meanwhile, the country's most prestigious newspaper, the *Helsingin Sanomat*, amended its editorial policy, reviewing all relevant content with

Nokia before publication (Linden 2012: 271). Alternative perspectives, to the extent that they existed, were buried by the coverage of Nokia's accomplishments (Ornston 2018).

BlackBerry's relationship with the Waterloo region was very different. To be clear, the company was not an archetypical "enclave" enterprise. As one politician noted, "[BlackBerry] had this incredible loyalty to the community. I don't think there would be another company that was so loyal to the community, whose owners invested so much" (Interview with former politician, 28 November 2017, Waterloo). Others identified the enterprise as an important partner in regional branding efforts (Interview with journalist, 15 March 2016). But the firm's political influence was more modest than Nokia's. This was partly due to the dearth of relevant policy instruments at the municipal and regional level. But the firm was also more aloof than Nokia. The politician above continued by likening BlackBerry to "the Vatican in Rome," noting "They lived their own life The only time we'd be involved was when they wanted to build a building. They never had an impact on our policy decisions" (Interview with former politician, 28 November 2017, Waterloo). This cordial, but arms-length relationship also extended to the local industry association, Communtech (in contrast to Nokia's dominance within Technology Industries of Finland).

Consider education, where BlackBerry's influence was the most conspicuous. The firm enjoyed a close relationship with the University of Waterloo. Co-founder Mike Lazaridis described university graduates to a valuable natural resource, (Sweeny 2009: 35) and management deliberately designed their offices to face campus (McQueen 2010: 197-98). BlackBerry clearly influenced the curriculum at the University of Waterloo, not least through an apprentice-style system of co-op education, which diffused new ideas from the

BlackBerry workplace into the classroom (Munro and Bathelt 2014). BlackBerry, however, could not directly influence university output the way Nokia did.

In other areas, the firm's influence was even more modest. Executives donated generously to the university, giving \$70 million to establish the Perimeter Institute for Theoretical Physics and \$50 million to found the Balsillie School of International Affairs at the University of Waterloo (Gillmor 2012). In doing so, however, Mike Lazaridis and Jim Balsillie acted as individuals rather than a company. Unlike Nokia's involvement in Finland, these investments were not connected to BlackBerry's strategic vision (Interview with professor 24 November 2017, Waterloo). Research collaboration was also less systematic (Sweeny 2009: 35). While some departments such as electrical engineering worked closely with BlackBerry, other departments, even technical ones, did not (Interview with professors 22 and 24 November 2017, Waterloo). Contrasting BlackBerry to Nokia and Nortel, the former Canadian tech titan, a faculty member remarked,

Everyone had partnerships with Nortel and did things with Nortel. It was hard to have a policy review where a Nortel representative was not present. Not only here, but in Ottawa, government things, you wouldn't assemble something on university-government relations and not have Nortel on it. But I don't remember people from BlackBerry. BlackBerry never had that status. It seemed that you didn't need a BlackBerry person. Nortel, and IBM maybe (Interview with professor, 22 November 2017, Waterloo).

This quote reflects BlackBerry's limited clout at the provincial and federal level, partly as a reaction to Nortel's collapse during the dot com crash. While provincial and federal policymakers mobilized resources around the enterprise, support was inconsistent. BlackBerry received \$4.7 million from the Ontario Technology Fund in the 1990s and \$39.7 million from Technology Partnerships Canada at the turn of the millennium, as well as tax credits for research and development, but some of this support was directed at other

regions and BlackBerry did not receive any public funding after 2004 (McQueen 2010: 198; Sweeny 2009: 77). More importantly, funding was directed BlackBerry itself instead of being used to construct Finnish-style academic and industrial networks.

Partly as a result of this, BlackBerry's Vatican-like isolation extended to the private sector. Sub-contractors, such as Certicom, were the exception rather than the rule. When asked to identify firms that worked with BlackBerry, interviewees (Interviews with journalist and industry representative, 15 March 2016) and secondary sources (Gillmor 2012) alike identified caterers or restaurants rather than component suppliers or software providers. The firm's most important partners were located elsewhere in Canada (e.g. Celestica) or outside of the country (e.g. Elcoteq, a Finnish firm) (Yakabuski 2009). This is typical of the Waterloo region, where inter-firm linkages are relatively weak (Munro and Bathelt 2014). Nor, as noted above, was BlackBerry particularly conducive to spinoffs (Interviews with journalist 15 March 2016 and former venture capitalist, 23 November 2017, Waterloo).

Partly as a result of its limited engagement in the local economy and politics, BlackBerry never exercised the hegemonic influence that Nokia exerted in Finland. To be clear, BlackBerry dominated local headlines (Interview with journalist, 15 March 2016) and politicians were pressured to support the firm by using BlackBerry devices and highlighting the firm's accomplishments (Interview with former executive, University of Waterloo, 23 November 2017). But BlackBerry's influence did not extend to the national media, which was divided between competing developmental models. Here, enthusiasm for rapid, innovation-based competition was tempered by the collapse of Nortel and the growth of natural resource exports, most notably oil.

By all measures, BlackBerry deserves its classification as a flagship firm. Controlling for population, the firm employed an even larger share of the local labor force and the ICT industry than Nokia in Finland. By redefining the region as a high-technology hub, BlackBerry also allowed Waterloo to attract human capital, public funding, and private sector investment (Gillmor 2012; Nelles et al. 2005). But BlackBerry's influence did not extend far beyond this. In contrast to Nokia, BlackBerry's sway over local, provincial, and federal policy remained modest, while the firm did not maintain a particularly large network of private sub-contractors or academic partners. This isolation could have been viewed as a weakness when the company was growing, but it was a clear asset after 2009.

When Flagships Falter: Post-Crisis Economic Adjustment in Waterloo and Finland

Because both Finland and Waterloo hosted flagship firms, the two regions faced some common challenges. BlackBerry and Nokia alike vacuumed up human capital during the 2000s. In Waterloo, "BlackBerry was sucking up every employee and driving wages higher. There was huge wage inflation, it was not a cheap place to find labor. So the startup culture was suffering because everyone was going to BlackBerry" (Interview with venture capitalist, 22, November 2017, Waterloo). In Finland, "Nokia has been all this time a big tree in the electronic industry that has been shadowing and killing almost everything. It has been a very high risk, especially in the 1990s. It was a huge risk for startups and the main reason was that Nokia was hiring so many engineers" (Interview with director, venture capital firm, 20 November, 2006, Finland). By 2012, the challenge was very different as the two enterprises dumped skilled labor even more rapidly than they had hired it. While both firms had a skilled labor force, neither one was particularly well-adapted to

entrepreneurship. In both regions, flagship employees were responsible for a relatively small number of new startups (Interview with economist, 7 June 2012, Finland, executive, technology firm 23 November 2017 and executive, Communitel, 1 December 2017, Waterloo).

In Finland, however, Nokia's central position within the ICT ecosystem compounded these challenges in three ways. First, Nokia's efforts to construct an entire network around its strategic vision inspired many start-ups to partner with the enterprise as sub-contractors. Many of the startups in Oulu, for example, cut their teeth supplying Nokia (Interview with venture capitalist 8 June 2012, Finland). This was particularly true of manufacturing, where many of Finland's most prominent ICT enterprises, including Elcoteq, Eimo, and Perlos, delivered components to Nokia. These firms declined after the dot com crash as Nokia reduced its manufacturing profile and relentlessly lowered costs (Seppälä 2010).

Software development continued after the dot com crash, however, and Nokia partnered with Finnish enterprises in its efforts to redefine itself as a software firm (Interview with executive officer, Nokia, 24 November 2006, Finland). Unlike the manufacturing firms above, these companies benefited from lower fixed costs and rapidly increasing demand for software by other Finnish enterprises. Nonetheless, they were hard hit by Nokia's decision to abandon work on its Symbian and MeeGo platforms. Finland's largest software firm, Tieto, was perhaps best positioned to withstand this shock by virtue of its multinational, diversified consultancy operations, but even it was forced to lay off workers. Other, more specialized operations were less fortunate (Interview with economist, 17 June 2016, Finland).

Second, even high-technology enterprises outside of Nokia's sphere of influence were affected by the firm's success. As an archetypical example of "Finnishness" and a point of national pride, it was hard not to follow Nokia's lead into telecommunications. Of the six prominent startups listed above that were not part of Nokia's sub-contracting network, four (Benefon, IOBox, SSH Communications, and Tecnoman) operated in the communications space. This was not an anomaly as analysts remarked on Finland's deep by narrow specialization in telecommunications (Hyytinen et al. 2006). This narrow focus created opportunities, most notably for mobile gaming enterprises such as Rovio and Supercell which capitalized on the growth of Apple's new iOS platform (Cutler 2013). But by ceding leadership in the development of 4G technologies and applications, Nokia's struggles disrupted a wide array of Finnish enterprises, including those outside of its subcontracting network.

Finally, Nokia influenced public policy in ways that systematically disadvantaged Finnish entrepreneurs. Not surprisingly, Nokia's influence over Finnish innovation policy encouraged the narrow pattern of specialization described above. As one frustrated tech executive summarized,

There's so much support for R&D, for internationalization and for other activities, but it is always about telecoms. I mean, what the hell? Why is that? It's as if telecoms companies are the only growth-oriented, hi-tech firms in Finland. I was at a meeting in India and about 60% of the meeting was only about telecoms. But there are other companies that could probably benefit even more from connections in India (Interview with executive, non-telecommunications firm, 24 October 2005, Finland).

This bias toward mobile communications may explain why so many entrepreneurs outside of the telecommunications industry criticized the Finnish Funding Agency for Technology and Innovation as irrelevant or incompetent (Ornston 2014). From the perspective of an

aspiring entrepreneur, however, public support clearly incentivized specialization in mobile communications.

Second and more importantly, Finnish innovation policies focused heavily on technological development (Leiponen 2004: 102). New firms, for example, were evaluated on the technical quality of their producers rather than their commercial viability (Interview with director, Tekes, 16 June 2016, Finland). A colleague confirmed, “Tekes was established in 1983 and was very focused on technology, technology was in the name ... Today, a huge amount of trouble comes from 1983 where we just looked at new technology” (Interview with director, Tekes, 9 June 2016, Finland). This may have worked for Nokia, a century-old conglomerate with sophisticated logistical capabilities and established marketing channels (Häikiö 2002), but it did not help inexperienced startups. First and second generation entrepreneurship policies in the 1980s and 1990s mobilize venture funding, but focused on alleviating capital shortages rather than delivering advice or support services (Luukkonen 2006). This relative inattention to commercialization and mentoring was exacerbated by the fact that many of Finland’s most successful startups were operating within Nokia’s orbit rather than interacting directly with consumers.

These one-sided innovation policies changed and changed rapidly following Nokia’s collapse. Tekes’ Vigo accelerator program, launched in 2009, explicitly focused on commercialization and mentorship rather than technical development, inspiring policymakers in Waterloo (Interview with former policymaker, 23 November 2017, Waterloo). Between 2005 and 2012, Tekes funding for start-ups tripled from 40 million to 130 million Euro (Interview with director, Tekes, 9 June 2016). Commenting on the change, a director remarked,

I have been here [for roughly a decade] and the application process at Tekes has changed a lot. Before, we were primarily interested in the technology, how new and promising the technology was. Today, we hardly focus on the technology at all. There needs to be a solid business model and market potential. There is a lot more attention to commercialization (interview with director, Tekes, 16 June 2016)

Increasing support was driven in part by increasing student interest in entrepreneurship. The Aalto Entrepreneurship Society, established in 2009, hosts its own business accelerator and has organized Slush, Europe's largest start-up conference (Best 2014; Toivonen 2014). Collectively, these developments have transformed the Finnish ICT ecosystem. In the words of a veteran venture capitalist, "[A decade ago,] I saw every single startup in Finland, either me or my team. Now I'm happy if we see one in five or one in ten. [Perhaps] we've become a little lazy, but so much is happening. The startup scene is sizzling" (interview with venture capitalist, 8 June 2016). Gaming, responsible for 20% of turnover in the ICT industry (Neogames 2014), has garnered the most international attention, but it is possible to identify promising enterprises in a much wider range of industries than the more specialized 1990s or 2000s (Interviews with venture capitalist, 8 June 2016, and director, Tekes, 16 June 2016, Finland).

While the post-Nokia reinvention of the Finnish ICT industry is impressive, the sector faces headwinds. ICT employment has not regained the heights it achieved under Nokia. The Finnish gaming industry, for example, employed only 2,750 in 2016. These modest employment figures obscure a much steeper decline in output. Efforts to boost employment and productivity are hampered by the relative immaturity of the sector. Finland has relatively few experienced, serial entrepreneurs and many of its most successful startups developed under Nokia's wing rather than independently defining

markets, internationalizing and managing customers. While Finland has made progress on this front, these deficits are particularly striking when juxtaposed with Waterloo.

In contrast to Nokia, BlackBerry did not construct a supplier network in Waterloo. As one technology executive bluntly observed, “RIM was very much organized and led as a single, homogeneous entity. It did not have an ecosystem, not in hardware and not in software” (Interview with former executive, technology firm, 29 November 2017, Waterloo). As a result, RIM’s collapse may have impacted caterers, hoteliers, intellectual property lawyers and other general service providers, but it did not affect technology firms (Dingman 2015). Nor were local firms particularly affected by the rise of the iOS and the Internet-enabled smartphone. Because BlackBerry was less dominant within policymaking circles and less hegemonic within the Canadian media, high-technology entrepreneurship, as modest as it may have been during the 1980s and 1990s, was less tightly coupled to telecommunications than in Finland (Interview with professor, University of Waterloo, 24 November 2017 and former executive, technology firm, 29 November 2017, Waterloo).

This more diversified ICT industry benefited Waterloo in two ways. First, the region could rely on a small but stable cluster of enterprises exploit the talent exiting BlackBerry. For example, medium-sized enterprises such as Open Text (4,000 employees) in Internet search or Desire2Learn (1,000 employees) in education were not adversely affected by BlackBerry’s collapse or the development of the iPhone. Politicians and technology executives describe a collective effort to place BlackBerry talent within these enterprises in the wake of the crisis (Interview with former politician, 28 November 2017 and former technology executive 29 November 2017, Waterloo). The former politician, above, claimed

that Communitech alone had 2,000 open jobs at the height of the crisis. This was only possible within a less tightly integrated ICT ecosystem.

Established enterprises could not hire all of the talent that left Waterloo, but they delivered a second benefit. Because these enterprises were not supplying BlackBerry, they had to secure their own risk capital, customers and marketing channels. Whereas the historic inattention to mentoring and dearth of experienced managers is a liability in the Finnish innovation system (Ornston 2018), aspiring entrepreneurs in Waterloo can turn to a wide variety of engaged entrepreneurs who effectively bootstrapped their organizations without BlackBerry's support. Indeed, new entrepreneurs and industry veterans describe these mentoring networks as one of the most valuable assets in the region (Interview with partner, venture capital fund, 22 November 2017, executive, high-technology firm, 23 November 2017, executive, technology firm, 28 November 2017, and executive 30 November 2017). To provide just one illustrative example,

When I came to join the folks at [a startup], one of the first things I did was ask to join a peer to peer group at Communitech for chief financial officers ... The thing that struck me was the way the community was open and willing to share with each other. I came in as an outsider and I had people to reach out with questions. What do I need to do to get SRED credits? Who is the best person to go to? What should my option plan look like? That mentorship has carried on to this day. Ten years ago, [I knew] that if I had a start-up I could send them somewhere for mentorship (Interview with former tech and venture capital employee, 23 November 2017, Waterloo).⁶

Public policy reinforced these strengths. Whereas Nokia reoriented Finnish innovation policies toward technical development, the creative tension between BlackBerry and

⁶ The Finnish gaming industry may represent the exception which proves the rule. While several gaming firms delivered products to Nokia, the tight-knit community formed its own network within the Finnish innovation system and constructed strikingly similar peer-to-peer mentoring networks among otherwise independent enterprises (Ornston 2018).

Communitech enabled the latter organization to prioritize the needs of small and medium-sized enterprises as early as the 1990s (Interviews with partner, venture capital firm, 22 November 2017 and executive, technology firm, 30 November 2017, Waterloo). While Finland successfully oriented its innovation policies in 2009, this infrastructure was more fully developed in Waterloo. Many remain concerned about the scarcity of senior managerial talent, especially in marketing (Interview with former venture capitalist, 23 November 2017) but there are also dissenting voices (Interviews with professor, University of Waterloo 23 November 2017 and former employee, technology firm, 24 November 2017) and these deficits were never as pronounced in Finland. As a result, Waterloo-based entrepreneurs could hit the ground running, whereas their Finnish counterparts faced the more daunting task of constructing an entrepreneurial ecosystem from scratch. This was less a function of long-standing institutional differences between the two communities than Nokia's outsized role within the Finnish innovation system and BlackBerry's more aloof posture.

Conclusions

While this comparative study of Finland and Waterloo suggests that the integration of flagship firms is fraught with peril, skeptics may question the decision to compare a region (Waterloo) with a nation-state (Finland). There are several ways to address this concern. We could point to parallel developments within specific Finnish communities, most notably Oulu, which closely resembles Waterloo in size (200,000), its youthful demographics, the presence of an entrepreneurial engineering university, and its recent but striking specialization in ICT. Like Finland as a whole, regional startups gravitated

toward telecommunications and Nokia in particular (Interview with venture capitalist 8 June 2012, Finland). While startup activity has surged since 2010, the region was hard-hit by Nokia's decline.

Because Oulu was influenced by the same, national-level influences that characterize Finland as a whole, however, it would be more insightful to compare BlackBerry to a deeply integrated flagship firm within Canada. Nortel, which dominated the local ICT ecosystem in Ottawa, provides a useful counterpoint, although there are opportunity costs in comparing the two firms. Unlike Nokia, Nortel was heavily focused on network equipment and declined a full decade earlier than BlackBerry. The enterprise, however, more embedded within its local community than Nokia ever was. In contrast to BlackBerry, the flagship emerged as a de facto member on government committees during the 1990s (Interview with professor, 22 November 2017, Waterloo). The enterprise was also more tightly connected to local ICT enterprises. Contrasting Communitech, which was inspired by the Ottawa-Carleton Research Institute, a veteran noted,

If you look around [Communitech], we had adjacencies, but not direct involvement. It might have been pennies, but the rest of the ecosystem was not tightly coupled ... The Ottawa ecosystem was a vibrant ecosystem that had as its consistent components Nortel, Mytel, Newbridge Networks and what was interesting is that you find the hallmark of a Nokia ecosystem in that they were all telecommunications. They were all tightly coupled to each other and when Nortel went down, they all went down (Interview with former Communitech board member, 29 November, 2017, Waterloo).

Like Finland, Nortel's dominance disadvantaged the region in two ways. In addition to Nortel's subcontracting network, Nortel's success and policy initiatives guided independent enterprises into telecommunications. As a result, the same forces that affected Nortel,

overinvestment in telecommunications networks, affected the entire industry (Interview with former Communtech board member, 29 November, 2017, Waterloo).

Like Finland, Nortel's decline was not a death sentence. The ICT ecosystem recovered and one could argue that Ottawa hosts a healthier and more sustainable technology cluster today (Creutzberg et al. 2017). None of the case studies in this paper support a broad-based critique of flagship firms. In addition to driving economic growth and delivering a wide variety of collective goods when they prosper, flagship firms can seed a diverse and vibrant ecosystem when they collapse. The nature of this transition, however, varies greatly. In Finland and Ottawa, the short-term effects of flagship collapse were catastrophic, triggering deep and protracted downturns in both ICT industries. By contrast, the consequences of BlackBerry's decline, while painful for many individuals, were surprisingly shallow and short-lived.

Comparative analysis suggests that this divergence has less to do with the flagship firms themselves than the way they are embedded within the local community. Deeper integration may facilitate investment in more sophisticated collective goods and drive knowledge spillovers, but it greatly increases vulnerability to disruptive shocks. The policy implications are clear. While embedding can deliver formidable benefits, networking initiatives, like Communtech in Waterloo, should focus on developing collaboration among smaller and medium-sized enterprises rather than connecting them to a flagship such as Nokia or Nortel. This may seem obvious, but it is an important and oft-overlooked counterpoint to the emphasis on achieving greater scale and coordination within national innovation systems, including Canada's (Nicholson 2016).

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