Key Performance Indicators in Pork Production:
An International Comparison Using 2023 Data

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This is the sixth in a series of annual reports from the Global Swine Benchmarking project that benchmarks international pork production. The first report was based on 2018 data, and this report updates the analysis to data for 2023. The series of reports allowed us to document and describe the roller-coaster impact of the 2018 African swine fever virus (ASFV) outbreak in China on the finances of pork producers worldwide. These reports have also spanned the COVID-19 pandemic and ASFV in several other countries in the Global Swine Benchmarking project, including Germany, the Czech Republic, Hungary, Italy, South Korea, and Vietnam. In 2022, global inflation reached its highest level since the mid-1990s. In 2023 and recent years, inflation, the pandemic, supply chain disruptions, a tight labor supply, rising interest rates, and geopolitical uncertainty made the economic environment anything but stable.

Prior reports have consistently shown an impressive level of animal productivity in Denmark and the Netherlands and documented the lowest production costs in Brazil and the USA.

The reports also include estimates of the value of improving key performance indicators in each country and describe the key indicators that drive financial performance. This report also compares changes in key indicators between 2022 and 2023.

The raw data comes primarily from an international benchmarking network known as InterPIG. The representatives of the seventeen participating countries listed in Appendix A come from scientific institutions and extension services of producer organizations and have built the database over several years.[1] Members meet once a year to update and actualize the dataset and ensure accurate cross-country comparisons. They use production and financial data from farm records to measure the countrywide average performance of representative pork farms. Definitions have been standardized across countries using a glossary of terms so, for instance, a "gilt" is defined in the same way in every data set, and carcass weights are adjusted to reflect whether the head is left on or removed. The InterPIG network also functions as a forum for information exchange.

Several key pork-importing countries do not participate in InterPIG. Representative data for four of them, China, Japan, South Korea, and Vietnam, was obtained with help from industry consultants in each country and MSD Animal Health (Merck Animal Health in the United States and Canada) technical, marketing, and sales staff. The intention is to add additional countries in future years.

1. The structure of the InterPIG network means that it is open to members of all important pig producing countries. But, access presupposes that each member contributes all data from his/her country required by the network.

The compiled data for the countries in Asia do not necessarily represent averages for all farms in each country. The data for Japan are for modern commercial farms of various sizes.The data for Vietnam and South Korea are for modern commercial farms of various sizes, free of ASFV. The data for China is for modern, large-scale, single-story, non-filtered farms that were free of ASFV. While the data for China, Vietnam, and South Korea was representative of farms free of ASFV, several values, such as market pig and feed prices, were significantly affected by the presence of the virus in those countries from 2019 through 2023. Once the Chinese swine herd recovered from ASFV, Chinese pork imports and world pig prices plunged. Productivity on farms free of ASFV, but where the disease was present in a country, was affected due to changes in the use of animal health products, marketing decisions, the source of gilts for breeding, and other changes made in response to the presence of the virus in each country.

The source of data for the countries in Asia is from published and unpublished farm records and other sources. In some cases, estimates were made from personal communication with consultants familiar with production in each country.

Outline of the Report

This report begins with a look at the raw data. All comparisons are for 2023, and the results are presented in U.S. dollars. Much of the information is available from reports written by InterPIG members, so the value-added here is the inclusion of China, Japan, South Korea, and Vietnam, and the approach we use to compare pig production across countries. Namely, we analyze which factors gave each country a competitive advantage or disadvantage. These calculations, which provide a novel approach to evaluating competitiveness, help us isolate how much advantage or disadvantage each factor conveys to producers in each country. Year-over-year comparisons were made to compare changes in key indicators between 2022 and 2023. We then calculated the marginal value of changes in key performance indicators.

There is no consensus on how performance should be measured. Breeding companies are interested in performance per breeding female, pig farmers evaluate performance per pig produced, and those interested in international trade measure performance based on kilograms of pork. We, therefore, present results using all three measures. Our comparison is at the farm level; therefore,

we miss a possible source of cost advantage for countries with low wages at the slaughter and processing stages. Most values are presented based on a breed-to-market system, where the breeding, nursery (rearing), and finishing (fattening) phases are combined. However, some values, such as feed prices, are presented individually for the breeding and wean-to-market (nursery and finishing combined) production phases.

Part 1: The Raw Data

Figure 1 shows the total carcass weight produced per breeding female, the average live weight per pig marketed, and the number of pigs marketed per year. As was true in previous years, Italy had the heaviest live weight and led in carcass weight marketed per breeding female. The Netherlands, Belgium, the Czech Republic, and Germany produced the next highest carcass weight per breeding female. Denmark, the Czech Republic, the Netherlands, and Belgium all exceeded 30 pigs marketed per female per year. Countries in Asia lagged in productivity and marketed the least carcass weight per breeding female. Major exporters such as the USA, Canada and Spain have surprisingly poor animal productivity when compared to Denmark, the Netherlands the Czech Republic, and Belgium.

Figures 2, 3, and 4 show the revenue, cost, and profit for each country in 2023. The results are presented on a per kg of carcass weight sold, per pig sold, and per breeding female basis in **Figures 2, 3, and 4,** respectively. **Figure 2** (bars) shows that Japan and South Korea had the highest production costs per kg of pork sold. China and Vietnam also had very high production costs. The states of Mato Grosso (MT) and Santa Catarina (SC) in Brazil, the USA, and Canada had the lowest overall costs. Brazil has two data points because of the vast differences between the traditional pig farming state of Santa Catarina and the new frontier in Brazilian pork production, Mato Grosso. Santa Catarina is recognized by the World Organization for Animal Health as free of foot and mouth disease virus (FMDV) without vaccination and is eligible to export to a wide range of countries. In 2023, Mato Grosso was recognized as free of FMDV with vaccination and could only export to a very limited list of importers. In May of 2025, the World Organization for Animal Health recognized Brazil as a country free of foot-and-mouth disease without vaccination. During the COVID-19 pandemic in 2020, the Brazilian currency (Real) fell by about 25%, and it has not recovered. Consequently, Brazilian prices expressed in U.S. dollars are lower than they would have been had the value of the Real not fallen relative to the U.S. dollar. Brazil is also free of porcine reproductive and respiratory syndrome virus (PRRSV), the most costly global swine industry disease. Consequently, **Brazil is now the world's low-cost supplier.** In earlier comparisons, the USA was about even or slightly lower cost than Santa Catarina.

Figure 2 also shows each country's market pig price (line) and net profit (shaded area). Market pig prices were highest in Japan, South Korea, China and Vietnam. Net profit was positive or near breakeven in Europe and Brazil, while losses were incurred in Japan, China, Canada and the USA. This is a reversal of the results in 2022, when European countries faced considerable losses as Chinese pork output recovered and exports from these countries fell. The USA was not as dependent on China as other countries because it faced a 25% retaliatory duty left over from the first trade war. USA pig prices in 2022 were relatively strong in large part because of government stimulus programs that strengthened domestic demand. The removal of these spending programs caused domestic demand to weaken in 2023.

The horizontal red line shows the average net profit across all countries, calculated as a simple average of profitability in all countries. This was at the breakeven level in 2023.

Figure 3 shows that Italy, South Korea, Japan and China had the highest costs when measured on a per pig sold basis. This reflects the heavy carcass weights, low productivity, and high feed costs in Italy and low productivity and high feed costs in South Korea and Japan.

Figure 4 shows the same data but on a per breeding female basis. Italy and Japan had the highest costs per breeding female. China is more competitive in this measure. As can be seen in Figure 1, Chinese breeding females were less productive than in other countries, with the second fewest pigs marketed per breeding female, which explains why China is ranked so poorly in terms of the cost per pig sold or per kg of carcass weight and yet is more competitive when the cost is expressed on a per breeding female basis. This is true because costs are spread over more females.

Figures 5, 6, and 7 (bars) provide additional detail on the breakdown of costs. Feed made up a large portion of costs in all countries, particularly in Asia. All of the countries in Asia import feed, and their feed markets are at import parity, which is determined by the import price plus tariffs and transport costs. Low feed costs in the USA and Brazil provided these two countries with a significant production cost advantage. This advantage was enhanced by lower energy, labor, and fixed costs. Brazilian costs are low because of a climate that allows for low-cost construction. Brazil has very low wages at the slaughter and processing level and this advantage is not included in Figure 5. Had we been able to include this additional wage cost advantage, Brazil's overall competitiveness would be even greater.

The information in Figures 5, 6, and 7 can also be expressed in percentage terms available in Appendix B. Each cost component as a percentage of the total cost does not vary when the results are reported on a per kg of carcass weight, per pig sold, or per breeding female basis. Therefore, a single table with the breakdown of costs by component as a percentage of the total cost is provided.

Figure 8 compares feed prices on a dollar per metric tonne basis for feed in the breeding and wean-to-market phases of production. Feed prices were highest in Asia, especially in Japan, Vietnam, and China, and lowest in the state of Mato Grosso in Brazil, Canada, the USA and the Czech Republic. Feed prices for countries in Europe generally fall in the middle.

Countries with lower feed prices also had lower market pig prices. In general, low feed prices will stimulate production until pig prices fall to equal the cost of production. It is also true that countries with high feed prices erect trade barriers or provide producer subsidies to protect domestic production.

Figure 9 compares labor cost per hour, or wage rate, against labor productivity, measured as the hours of labor used per breeding female for all production phases (breed-to-market). The Netherlands, Denmark, and Sweden had the highest labor cost per hour, and Spain, the Netherlands, USA and Canada, all major exporting countries, had the highest labor productivity (lowest labor usage). Vietnam, the Czech Republic, Hungary, Brazil (SC) and China had low labor productivity (high labor usage) and low hourly labor costs. Brazil (MT and SC) stands out as having extremely low labor costs per hour, which were magnified by the devaluation of the Real in 2020, which remained devalued in 2023. Generally, the higher the labor cost per hour in a country, the lower the labor usage (higher labor productivity).

Figure 10 shows whole herd feed conversion, which is calculated as kilograms of feed in all phases of production per kilogram of carcass weight sold. Italy, South Korea, China, Japan, and Vietnam performed poorly on this measure. One might have expected that countries with high feed costs in Asia would use feed more efficiently, but this is not the case. The heavy market weight of pigs in Italy contributes to the country's poor whole herd feed conversion.

Figure 11 shows mortality rates of pigs and breeding females. Birth-to-market mortality is reported as the number of pig deaths from birth-to-market expressed as a percentage of the number of pigs born alive. Spain, Canada, the USA, South Korea, Denmark, and France performed poorly on this measure, while producers in Brazil (SC and MT) and Hungary performed the best. Spain, the USA, and Denmark also had relatively high breeding female mortality rates.

Part 2. Sources of Competitive Advantage

Here we explore the factors that gave producers a leg up, measured by profit, over producers in other countries. We did this by setting each country's costs, prices, and productivity to the same value—the simple average for all countries. The only values that varied for each country were those for the factor evaluated. Each factor was evaluated alone, one at a time. Therefore, any differences in profitability are due strictly to the country's differences in the values for that factor. As an example, one of the factors evaluated was feed prices. For that factor, feed prices in the breeding, nursery (rearing), and finishing (fattening) phases of production were set to the values reported for each country. All other values were the same for every country, set to the average value of all countries. For each factor, the relative advantage or disadvantage is measured as the difference in profitability relative to a hypothetical country with average values for the factor evaluated. An advantage (disadvantage) is reported as a positive (negative) contribution to profitability above (below) the hypothetical average country. This data is color-coded with dark green shading representing the greatest advantage and dark red shading the greatest disadvantage. To reduce the number of figures to evaluate, we present results in a table on a dollars per kg sold basis **(Table 1)**. The table is sorted according to the second column, which is each country's overall profit advantage (disadvantage) compared to the average profitability of all the countries in 2023. The results expressed on a per pig sold **(Table C.1)** and per breeding female **(Table C.2)** basis are in Appendix C.

The factors that contributed to the highest relative advantage or disadvantage were market pig prices, feed prices, and productivity. The relative advantage or disadvantage of the other factors evaluated, wage rates, labor productivity, and fixed costs, were lower but still important.

The third column in Table 1 evaluates the contribution of market pig prices to profitability in 2023. Several countries in Europe benefited from relatively high market pig prices in 2023. Brazil (MT and SC), the USA and Canada lost out in this regard. High market pig prices in South Korea and Japan gave producers there a respective US$1.54 and US$1.30 per kg of carcass weight advantage over a country with average market pig prices. South Korea's advantage over Brazil (MT) was US$2.35, since Brazil (MT) had a US$0.81 disadvantage relative to the average. This means that, if somehow producers in South Korea and Brazil (MT) were made equal by every measure except market pig prices, with the same costs, same productivity, etc., producers in South Korea would have earned US$2.35 per kg of carcass weight more than those in Brazil (MT) in 2023 because of the higher market pig prices they received.

The fourth column in Table 1 provides the same comparison for feed prices. Brazil (MT), Canada, Finland, and the USA benefited from low feed prices, while countries in Asia fared poorly on this measure. Low feed prices in Brazil (MT) gave producers a US$0.47 per kg of carcass weight advantage over a country with average feed prices. Producers in Japan had the highest feed prices, placing them at a US$0.95 per kg carcass weight disadvantage to a country with average feed prices.

The fifth column in Table 1 evaluates the importance of genetics, health, nutrition, and animal husbandry (i.e., productivity in breeding, nursery (rearing), and finishing (fattening)). Denmark, the Czech Republic, the Netherlands, and Ireland led while South Korea, Japan, and China lagged. Producers in Denmark had the highest productivity, giving them a US$0.30 per kg of carcass weight advantage over a country with average productivity. Producers in Japan were at a US$0.56 per kg of carcass weight disadvantage to a country with average productivity.

The sixth column in Table 1 evaluates the impact of fixed costs, which are determined primarily by building costs, estimated lifetime of buildings and equipment, and maintenance costs, on relative profitability. Low fixed costs provided the greatest competitive advantage to producers in Japan, China, Brazil (SC and MT) and Spain. Higher fixed costs provided the largest competitive disadvantage to producers in Italy, Austria, Hungary and South Korea.

The seventh column in Table 1 evaluates labor productivity, measured as the labor hours used for all production phases (breed-to-market). The Netherlands, the USA, and Spain performed well under this measure, while Vietnam, China, the Czech Republic and Hungary lagged.

The eighth column in Table 1 shows the other part of the labor equation by comparing the cost of labor per hour or wage rate. Countries with low labor productivity, including Vietnam, Brazil (SC and MT), China, and Hungary had low wage rates. The Netherlands, Denmark, and Sweden had the highest wage rates, providing producers in those countries the greatest competitive disadvantage to producers in other countries. To evaluate labor costs, labor productivity and wage rate are evaluated together (ninth column). Vietnam fared well on this measure because very high labor usage was more than offset by the low cost of labor per hour in that country. Brazil (MT and SC), Spain, the USA, Canada and China also fared well, and the Czech Republic, Italy, Austria, Finland, Japan, and South Korea did poorly. Producers in the state of Mato Grosso in Brazil had the lowest labor costs, giving them a US$0.11 per kg of carcass weight advantage over a country with average labor costs.

Part 3. Year-over-Year Comparisons 2023 versus 2022

Table 2 compares several key productivity and financial measures between 2022 and 2023. Vietnam and Japan had the largest increase in total carcass weight per female. This was mainly due to a significant increase in the slaughter weight of pigs in both countries and a reduction in growing pig mortality in Japan. Belgium, Denmark and Brazil also saw a rise in total carcass weight per female. The negative value for China is surprising because the country is reportedly recovering from ASF.

The net profit measures on the right-hand side of Table 2 show that 2023 was a good year in most of Europe compared to 2022, and a bad one in China and the USA. The simple average of profitability across all countries year-over-year increased by US$0.28 per kg of carcass weight as feed prices fell and market pig prices increased nearly everywhere.

Part 4. Marginal Values of Key Performance Indicators

When producers in any country consider changes in feed diets, genetics, or animal health interventions to improve productivity, they frequently conduct some cost-benefit analysis, whether formal or informal. This is not easy because the value of productivity improvements depends on market pig prices, feed prices, fixed costs, and other factors and, therefore, will vary over time and from one country to another. For example, what is the value of reducing mortality from wean-to-market by one percent? The answer is different for each country depending on the market pig prices, feed prices, fixed costs, and other factors for that country in 2023. The results reported in this section are intended to help producers make better cost-benefit calculations for decision-making, such as whether to use a vaccine or an antimicrobial to reduce disease and improve productivity.

The model used for this analysis links all phases of production from breeding to market. We can, therefore, change any productivity measure and calculate the impact on profits from breed-to-market. To operationalize this, we incrementally changed litters farrowed per female per year by 0.05, pigs born alive per litter farrowed by 0.25, pre-wean mortality and wean-to-market mortality by a negative one-percentage point, average daily gain by 0.01 kg per day, and feed conversion by a negative 0.025 kg of feed per kg of gain. To isolate the impact of each, incremental changes in these key productivity measures were made individually, with all other factors remaining at their original values for each country. The outcome is the benefit, measured as the increase in profitability, given the incremental change in the key productivity measure. The results for each country are summarized in **Table 3.**

The differences between countries are substantial. A 0.25 pig increase in the number of pigs born alive per litter farrowed in Italy, for example, yielded a marginal increase in profit of US$38.18 per breeding female per year. In Canada, the same incremental improvement in pigs born alive per litter farrowed yielded a marginal increase in profit of only US$4.76 per breeding female per year. This has significant implications for resource allocation and investment decisions made by producers. To breakeven, a producer in Italy could spend US$38.18 on an intervention to get a 0.25 pig increase in the number of pigs born alive per litter farrowed, while producers in the Canada, could only spend US$4.76 to get the same 0.25 pig increase in the number of pigs born alive per litter farrowed.

The degree to which an increase in all of the key productivity measures, except the wean-to-market feed-to-gain ratio, will increase profit is a function primarily of 1) fixed costs, 2) market pig prices, and 3) feed prices (the main variable cost). When market pig prices are high relative to feed prices, the profit earned on each pig or kg of pork sold is relatively high. The marginal value of weaning extra pigs, lowering mortality, or increasing average daily gain to increase the kg of pork sold is greater when raising pigs is already profitable. As the number of pigs weaned and kg of pork sold goes up, the incremental increase in profitability will be greater in countries with higher fixed costs since those higher fixed costs are spread over more pigs, i.e., economies of scale. The extent to which an increase in the wean-to-market feed-to-gain ratio will increase profit per pig sold depends on feed prices and the weight of pigs at market.

The marginal value of improving the feed-to-gain ratio is highest when feed prices are high and when pigs are marketed at heavier weights.

Conclusions

The questions that continue to motivate this work are, who are the world's best pork producers and why? How can competitiveness best be measured? What is the value of improving key performance indicators in each country, and what are the key factors that drive financial performance? The answer to these questions is that it depends.

If we compare pork producers based on profitability, as we do when we evaluate companies, then Spain, Belgium, Italy, and the Netherlands come out on top in 2023. If we use animal husbandry and productivity as a performance measure, then Denmark, the Netherlands, Belgium and the Czech Republic rank at the top. Using production costs as a metric, Brazil is the most competitive.

This latter measure makes most sense if we are interested in trade in pork meat, and in this regard, Mato Grosso can be ruled out because they were prohibited from exporting to the most lucrative import markets in 2023. The source of the competitiveness of producers in the USA is not just cheap feed. The USA has high labor productivity even though the cost of labor per hour is below that of countries that use similar amounts of labor. The USA also has low fixed costs. However, relatively low productivity in the USA is a persistent competitive disadvantage for producers there. Understanding the competitive advantages and disadvantages of countries is an ongoing pursuit. Changes occur annually as country-specific situations change (e.g., policy directives, disease outbreaks), and global market conditions evolve.

Acknowledgments

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Figure 1. Total carcass weight produced per breeding female, average live weight, and number of pigs marketed-2023.

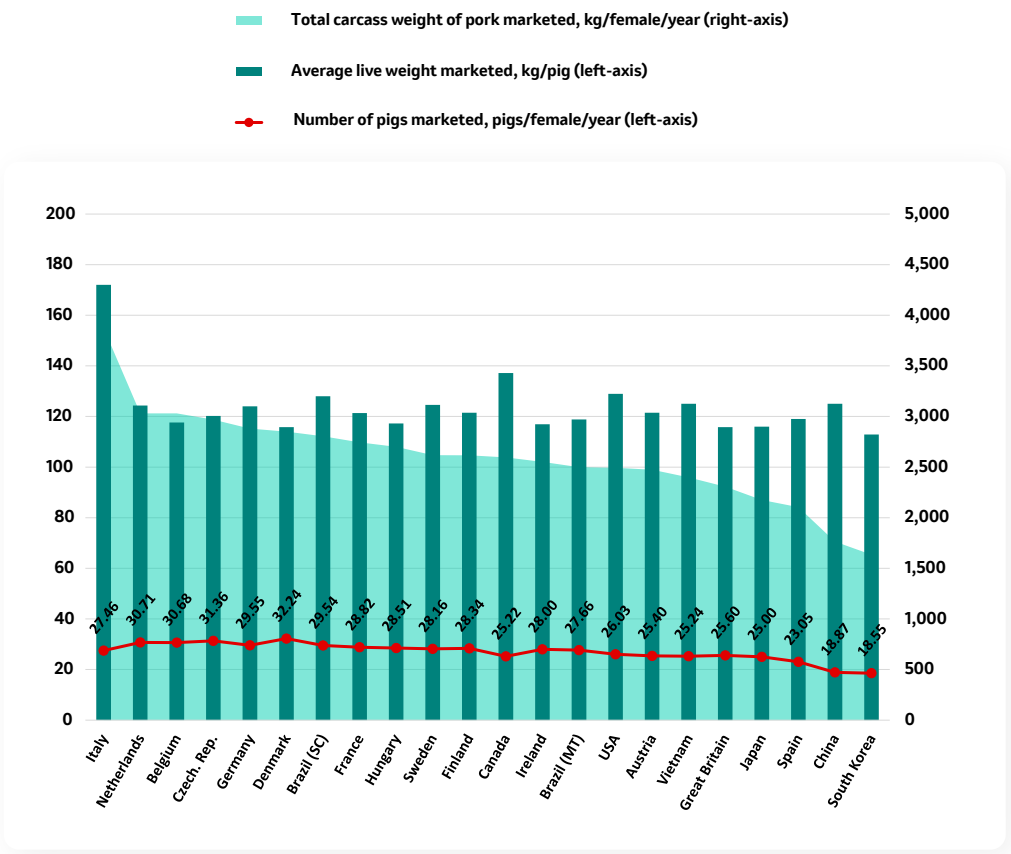


Figure 2. Revenue, cost, and profit per carcass kg sold - 2023.

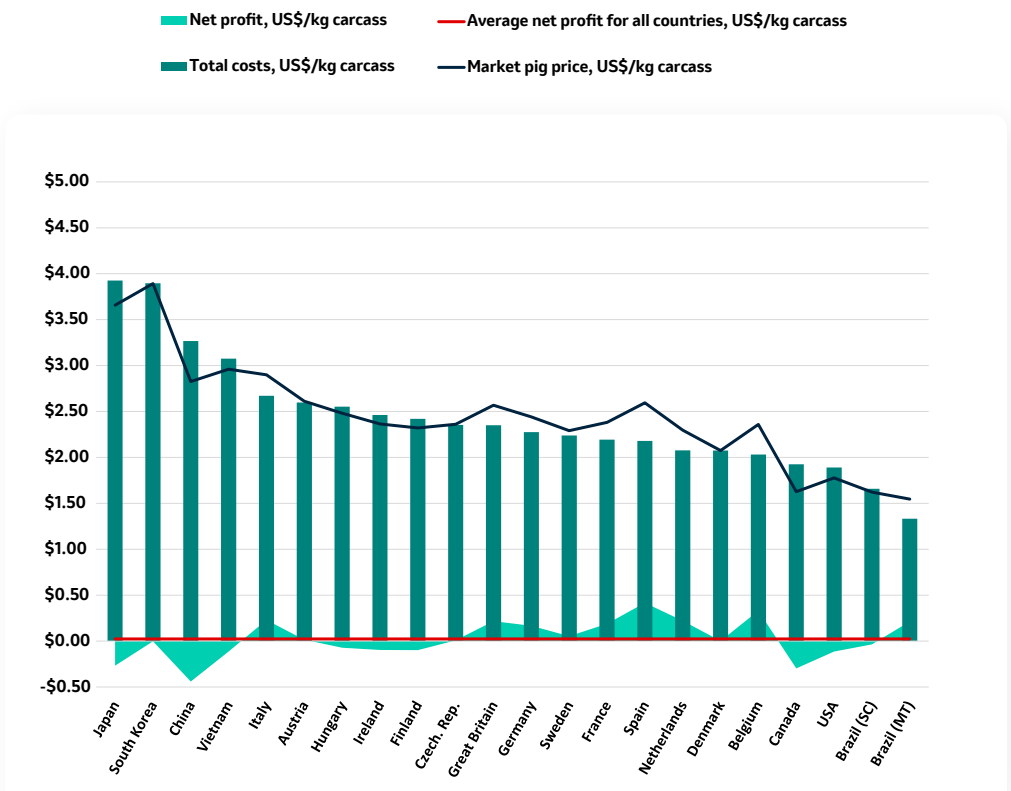


Figure 3. Revenue, cost, and profit per pig sold-2023.

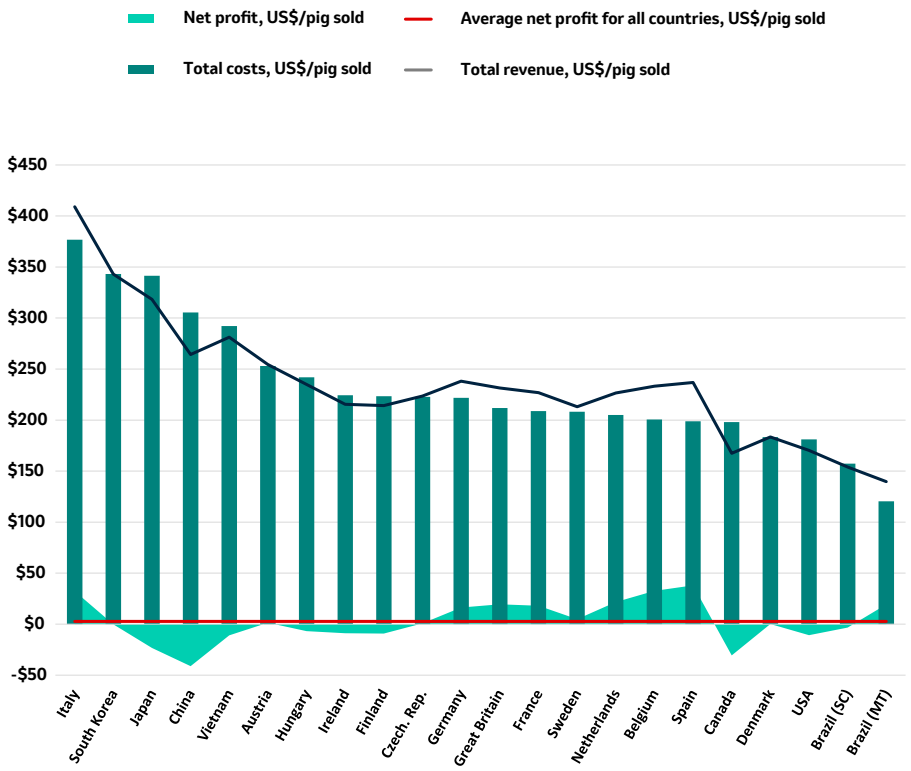


Figure 4. Revenue, cost, and profit per breeding female - 2023.

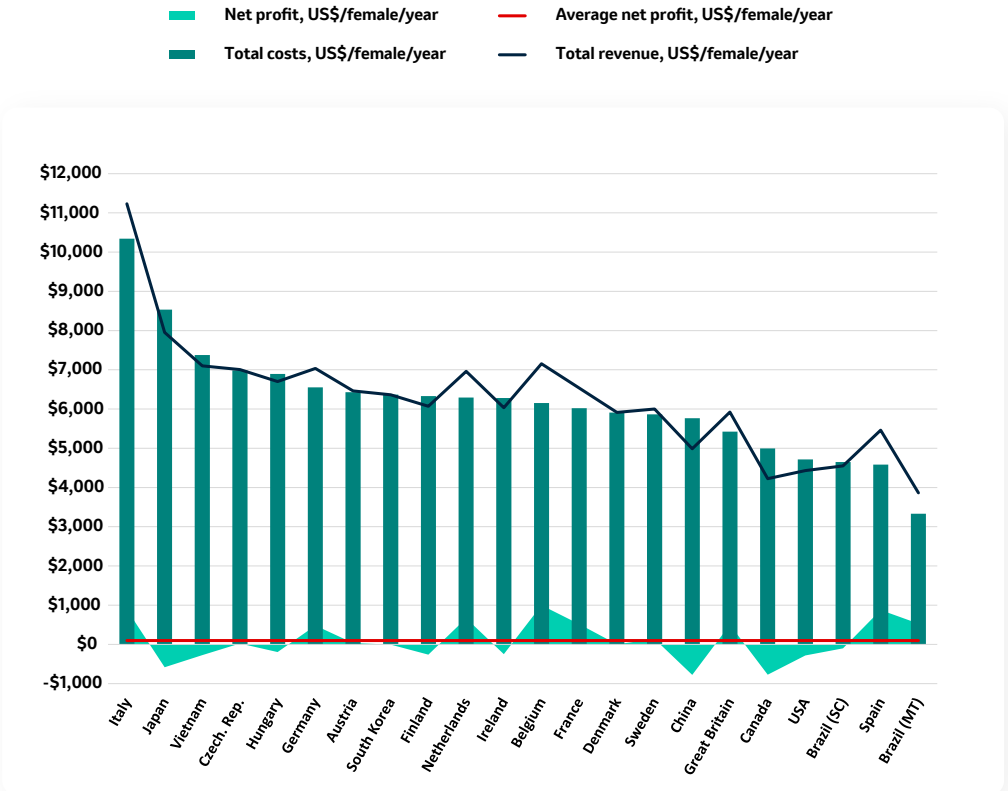


Figure 5. Detailed costs per carcass kg sold-2023.

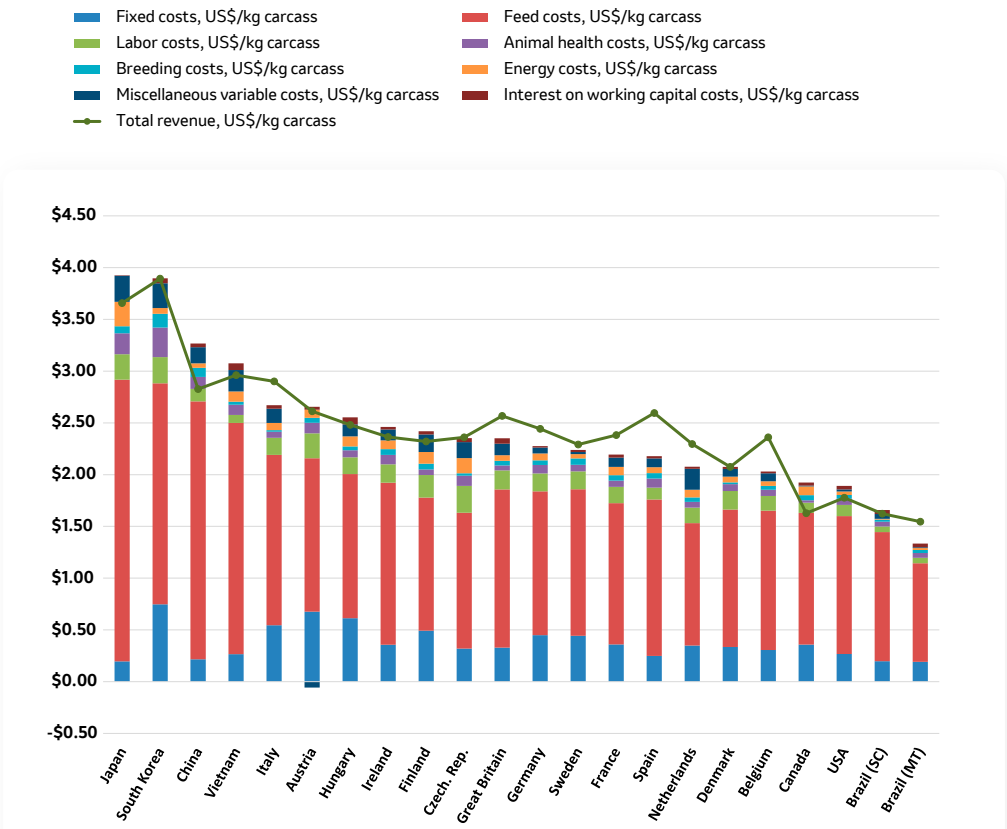


Figure 6. Detailed costs per pig- 2023.

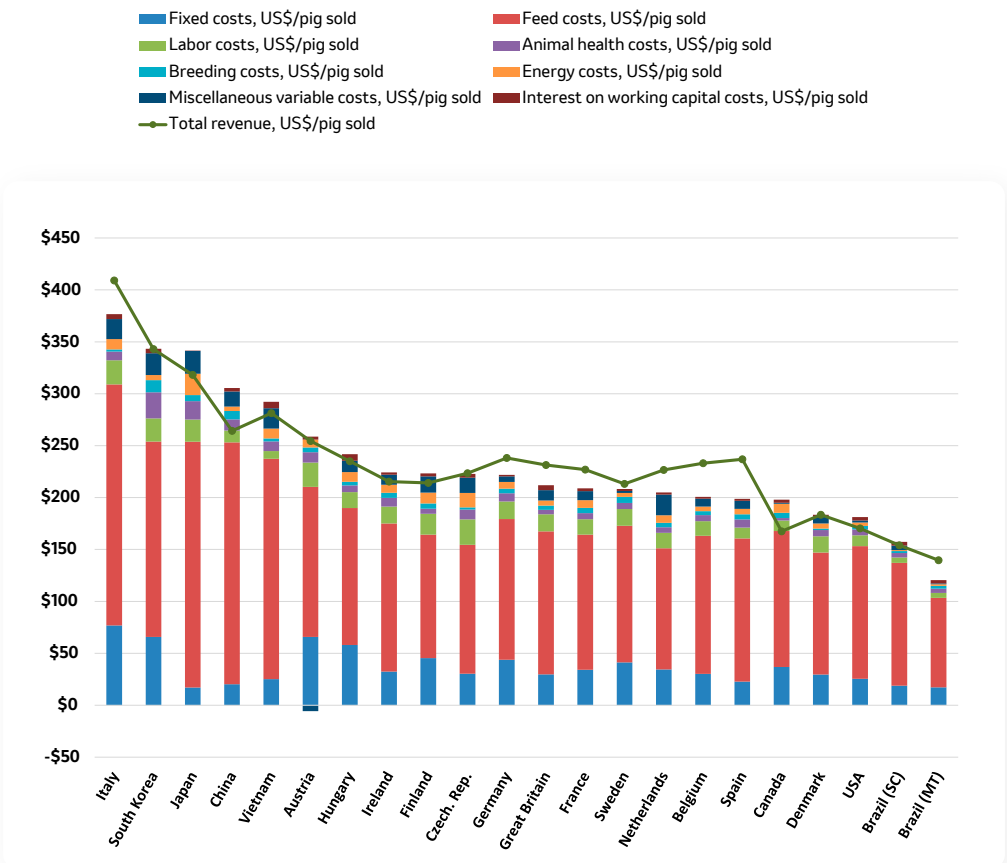


Figure 7. Detailed costs per breeding female -2023.

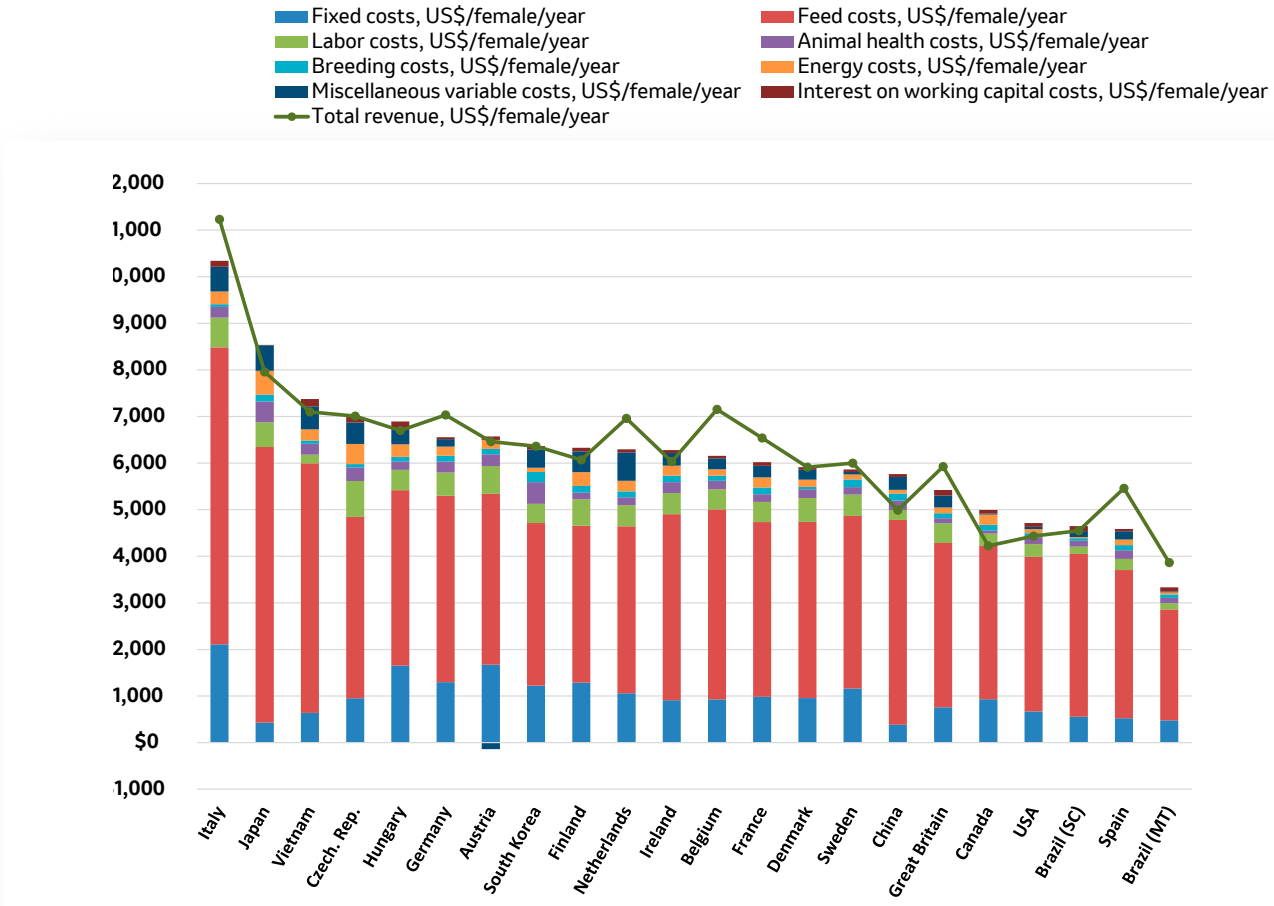


Figure 8. Feed costs by phase of production and market pig prices- 2023.

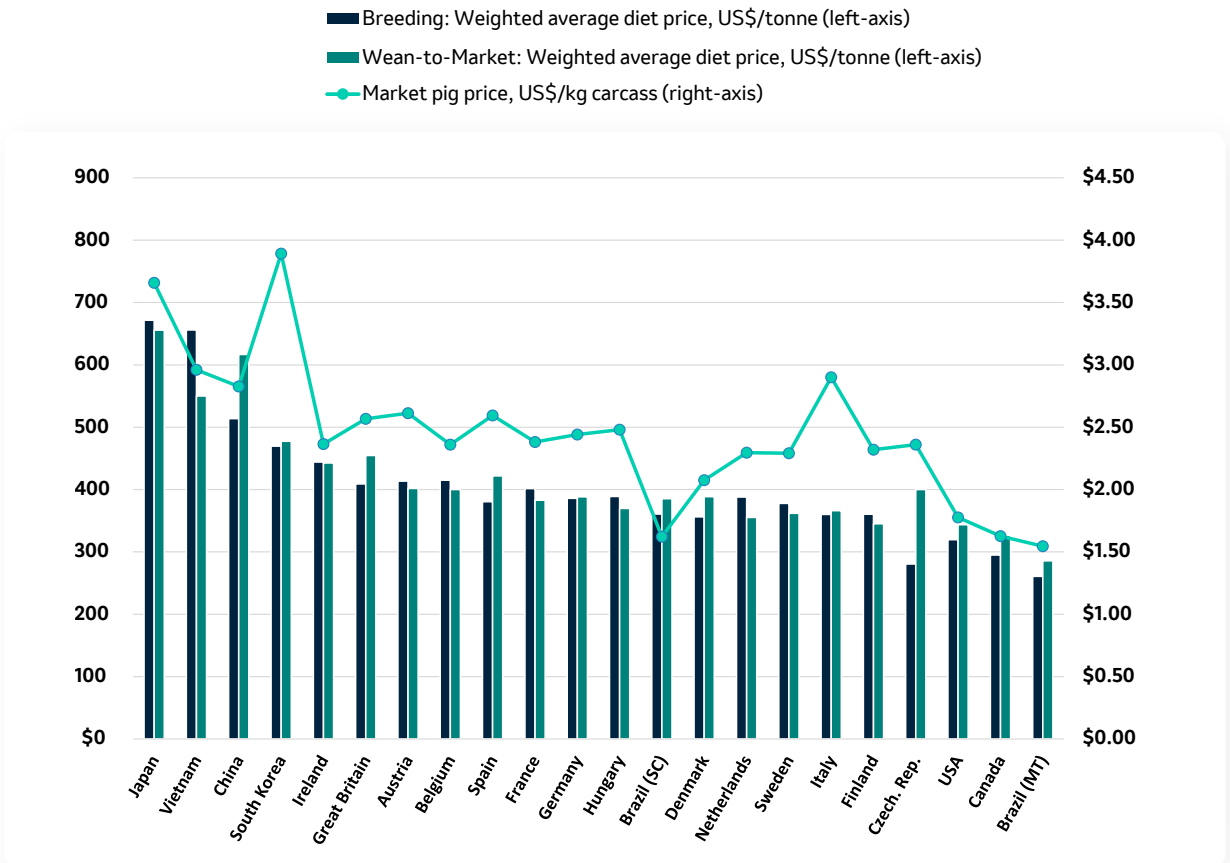


Figure 9. Labor usage and cost-2023.

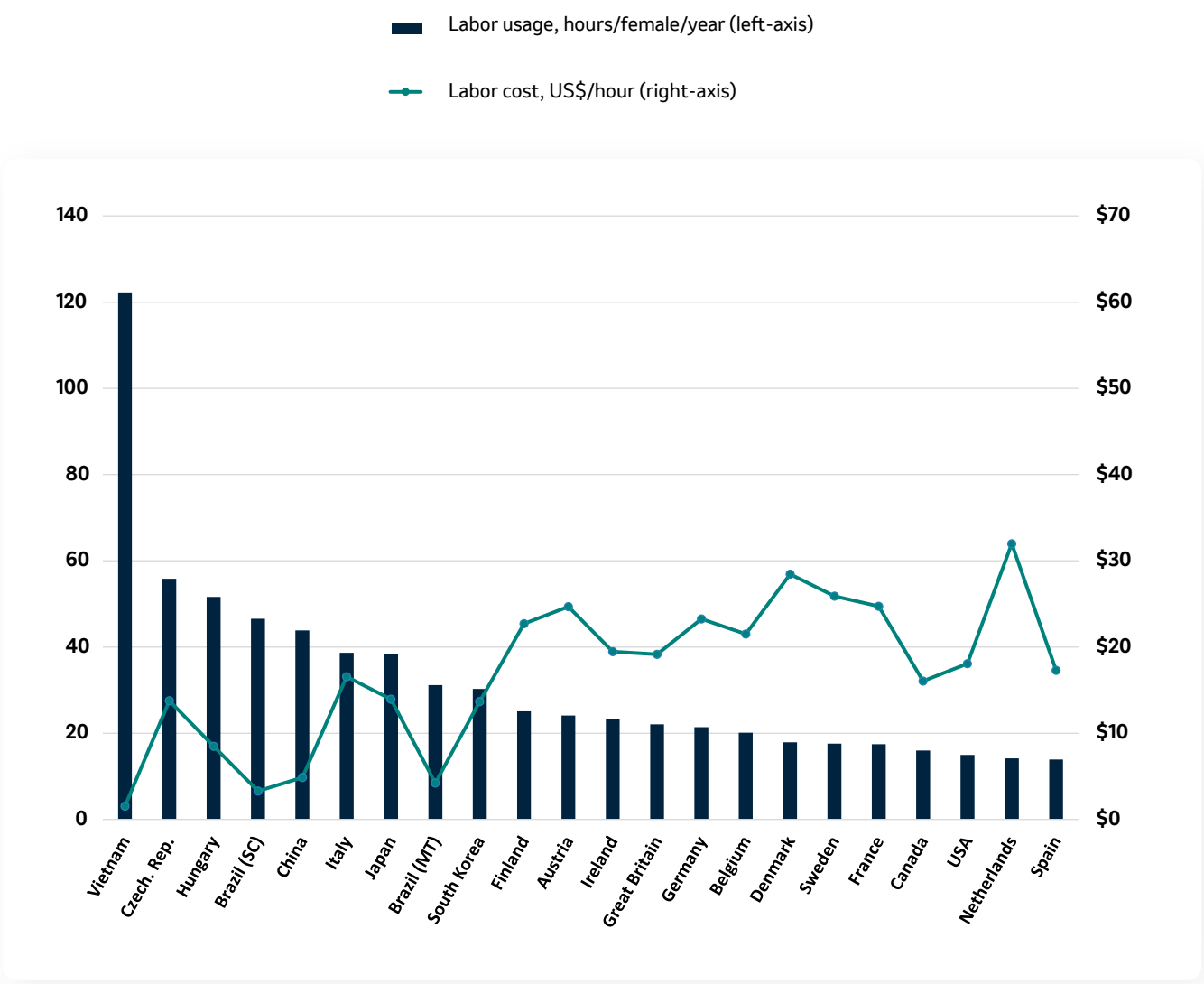


Figure 10. Whole herd feed conversion 2023.

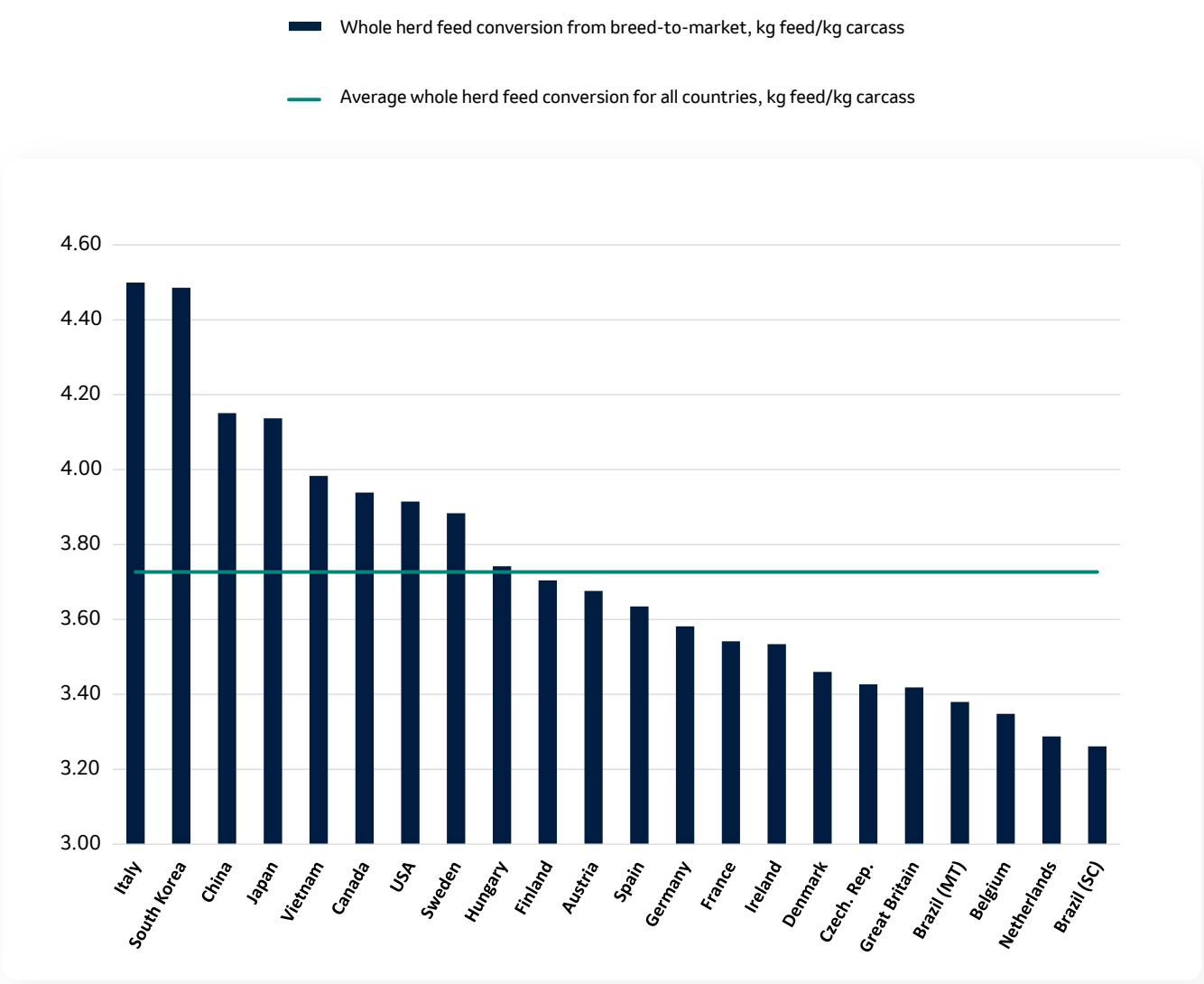


Figure 11. Mortality rates-2023.

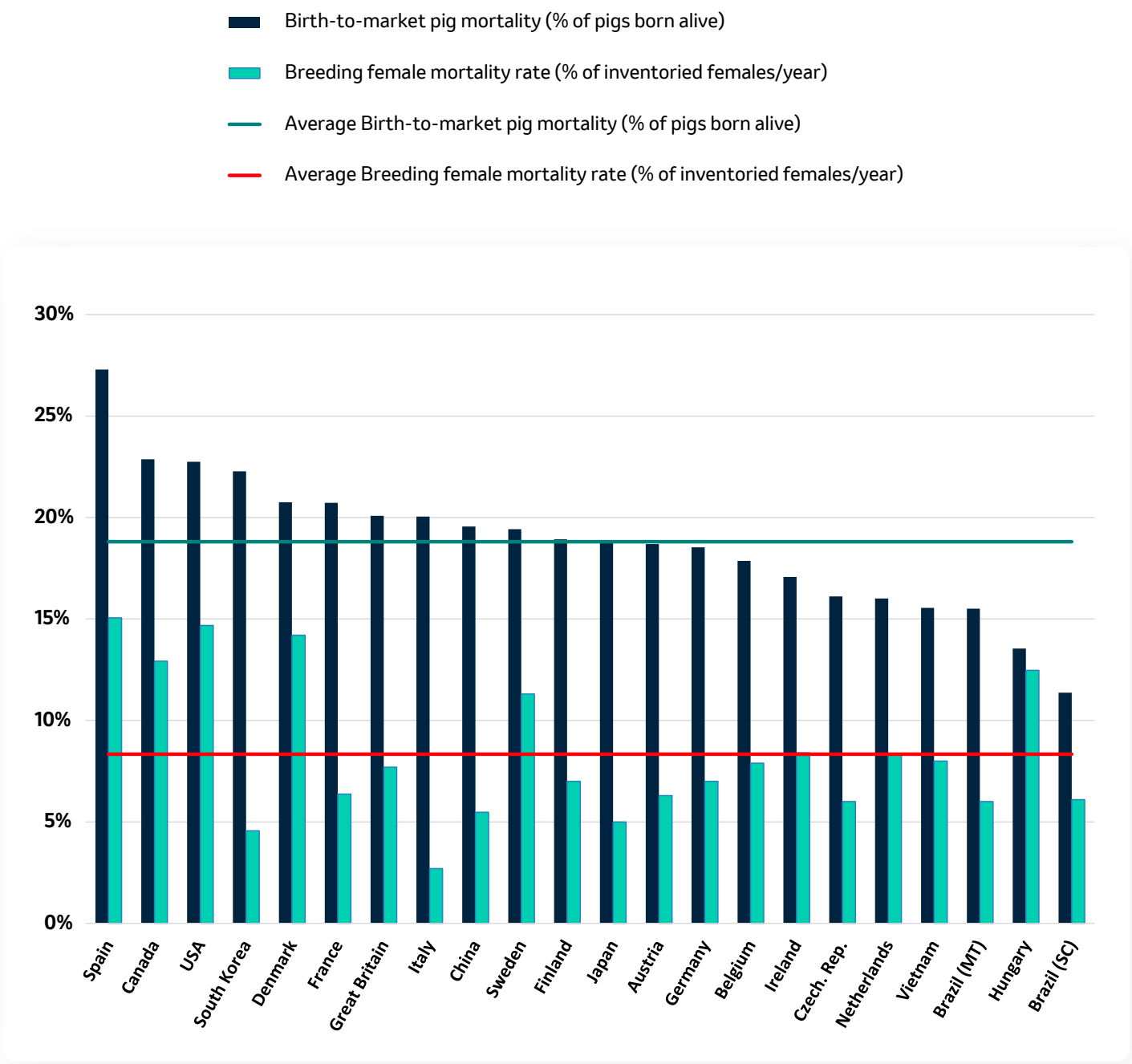
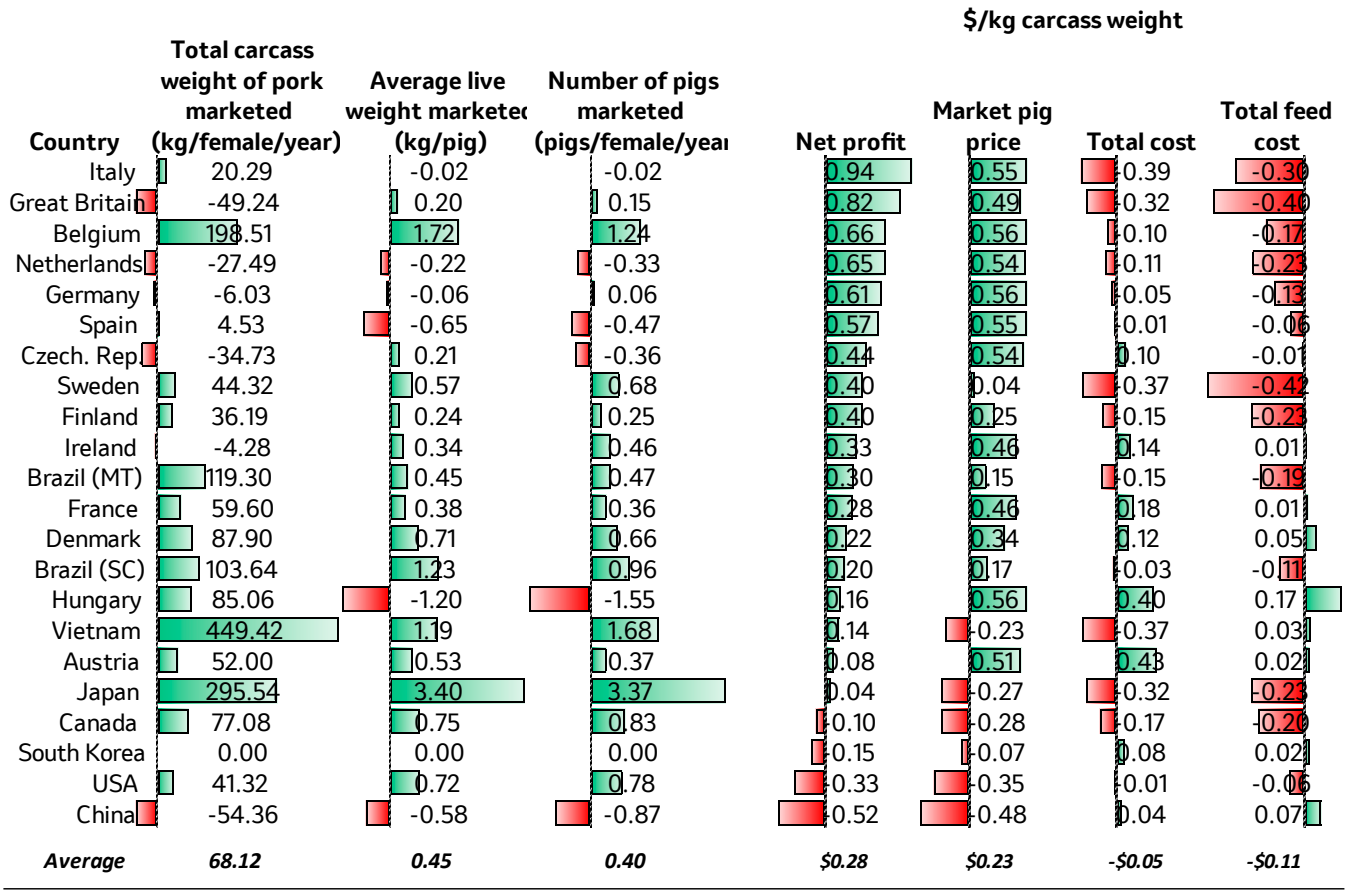


Table 1. Profit advantage of select factors, all other variables held constant, US$ per carcass kg sold basis, 2023.

Country	Profit advantage over average	Market pig prices	Feed prices	Productivity	Fixed costs	Labor usage	Wage rates	Labor Usage & Wage Rates
Spain	$0.39	$0.24	-$0.08	-$0.27	$0.15	$0.08	$0.01	$0.06
Belgium	$0.31	$0.00	$0.00	$0.15	$0.05	$0.06	-$0.05	$0.01
Italy	$0.21	$0.54	$0.10	-$0.36	-$0.42	-$0.07	$0.02	-$0.08
Netherlands	$0.20	-$0.06	$0.15	$0.26	$0.00	$0.09	-$0.18	$0.00
Great Britain	$0.19	$0.21	-$0.13	$0.16	$0.07	$0.03	-$0.02	-$0.01
Brazil (MT)	$0.19	-$0.81	$0.47	$0.15	$0.19	-$0.02	$0.17	$0.11
France	$0.17	$0.03	$0.07	$0.08	$0.01	$0.07	-$0.09	$0.00
Germany	$0.14	$0.09	$0.06	$0.11	-$0.10	$0.05	-$0.07	-$0.02
Sweden	$0.03	-$0.06	$0.15	$0.06	-$0.06	$0.07	-$0.10	-$0.01
Austria	-$0.01	$0.26	$0.01	$0.00	-$0.29	$0.02	-$0.08	-$0.08
Czech. Rep.	-$0.02	$0.01	$0.08	$0.28	$0.04	-$0.16	$0.05	-$0.12
Denmark	-$0.02	-$0.28	$0.08	$0.30	$0.04	$0.07	-$0.13	-$0.02
South Korea	-$0.03	$1.54	-$0.27	-$0.71	-$0.21	-$0.07	$0.05	-$0.04
Brazil (SC)	-$0.06	-$0.73	$0.06	$0.16	$0.17	-$0.11	$0.18	$0.10
Hungary	-$0.10	$0.13	$0.10	$0.03	-$0.25	-$0.15	$0.12	$0.00
Ireland	-$0.12	$0.01	-$0.11	$0.21	$0.03	$0.03	-$0.02	-$0.01
Finland	-$0.12	-$0.04	$0.22	$0.15	-$0.11	$0.02	-$0.06	-$0.05
USA	-$0.14	-$0.58	$0.19	-$0.19	$0.11	$0.08	$0.00	$0.06
Vietnam	-$0.14	$0.61	-$0.65	-$0.30	$0.12	-$0.65	$0.21	$0.08
Japan	-$0.29	$1.30	-$0.95	-$0.56	$0.20	-$0.08	$0.05	-$0.05
Canada	-$0.32	-$0.73	$0.29	-$0.22	$0.00	$0.07	$0.02	$0.06
China	-$0.46	$0.47	-$0.75	-$0.51	$0.18	-$016	$0.16	$0.06

Table 2. Year-over-year comparisons of key indicators, 2023 vs. 2022.



Country	Total carcass weight of pork marketed (kg/female/year)	Average live weight marketed (kg/pig)	Number of pigs marketed (pigs/female/year)	$/kg carcass weight: Net profit	Market pig price	Total cost	Total feed cost
Italy	20.29	-0.02	-0.02	0.94	0.55	-0.39	-0.30
Great Britain	-49.24	0.20	0.15	0.82	0.49	-0.32	-0.40
Belgium	198.51	1.72	1.24	0.66	0.56	-0.10	-0.17
Netherlands	-27.49	-0.22	-0.33	0.65	0.54	-0.11	-0.23
Germany	-6.03	-0.06	0.06	0.61	0.56	-0.05	-0.13
Spain	4.53	-0.65	-0.47	0.57	0.55	-0.01	-0.06
Czech. Rep.	-34.73	0.21	-0.36	0.44	0.54	-0.10	-0.01
Sweden	44.32	0.57	0.68	0.40	0.04	-0.37	-0.42
Finland	36.19	0.24	0.25	0.40	0.25	-0.15	-0.23
Ireland	-4.28	0.34	0.46	0.33	0.46	-0.14	0.01
Brazil (MT)	119.30	0.45	0.47	0.30	0.15	-0.15	-0.19
France	59.60	0.38	0.36	0.28	0.46	-0.18	0.01
Denmark	87.90	0.71	0.66	0.22	0.34	-0.12	0.05
Brazil (SC)	103.64	1.23	0.96	0.20	0.17	-0.03	-0.11
Hungary	85.06	-1.20	-1.55	0.16	0.56	-0.40	0.17
Vietnam	449.42	1.19	1.68	0.14	-0.23	-0.37	0.03
Austria	52.00	0.53	0.37	0.08	0.51	-0.43	0.02
Japan	295.54	3.40	3.37	-0.04	-0.27	-0.32	-0.23
Canada	77.08	0.75	0.83	-0.10	-0.28	-0.17	-0.20
South Korea	0.00	0.00	0.00	-0.15	-0.07	-0.08	0.02
USA	41.32	0.72	0.78	-0.33	-0.35	-0.01	-0.06
China	-54.36	-0.58	-0.87	-0.52	-0.48	-0.04	0.07
Average	***68.12***	***0.45***	***0.40***	***$0.28***	***$0.23***	***-$0.05***	***-$0.11***

Table 3. Marginal value of incremenytal changes in key productivity indicators (KPI),* 2023

	US$/breedingfemale/year			US$/pigplaced		
	Litters farrowec / female /year	Pigs born alive / litter farrowed	Prewean mortality (% of pigs born alive)	Wean-to-market Mortality (% of pigs placed)	Wean-to-market Average daily gain (kg / day)	Wean-to-market Feed-to-gain ratio (kg feed / kggain)
Increment	0.05	0.25	-1.0%	-1.0%	0.01	-0.025
Italy	$45.53	$38.18	$25.26	$1.55	$2.57	$1.46
South Korea	$47.77	$44.97	$22.46	$1.66	$2.34	$1.16
Belgium	$50.48	$37.01	$27.06	$1.17	$1.50	$1.07
Spain	$44.72	$34.50	$23.44	$1.29	$1.41	$1.09
France	$45.18	$33.74	$24.90	$1.12	$1.35	$1.07
Netherlands	$45.76	$33.86	$24.22	$1.03	$1.45	$1.02
Austria	$40.36	$33.58	$21.47	$1.15	$1.52	$1.12
Great Britain	$43.99	$33.23	$22.30	$1.17	$1.24	$1.19
Germany	$43.50	$32.00	$23.34	$1.09	$1.34	$1.10
Hungary	$38.55	$29.85	$19.26	$1.01	$1.36	$1.02
Czech. Rep.	$38.36	$27.43	$19.93	$0.95	$1.16	$1.11
Sweden	$38.22	$27.44	$20.41	$0.99	$1.00	$1.02
Japan	$21.61	$19.21	$11.53	$1.13	$1.46	$1.71
Ireland	$30.96	$23.42	$15.78	$0.92	$1.01	$1.17
Finland	$31.98	$23.57	$17.04	$0.86	$1.17	$0.96
Vietnam	$19.90	$18.38	$10.39	$1.03	$0.97	$1.60
Denmark	$32.18	$19.74	$16.81	$0.80	$0.80	$1.02
Brazil (MT)	$27.25	$23.97	$14.82	$0.73	$0.74	$0.80
China	$9.20	$7.61	$4.11	$0.90	$0.62	$1.74
USA	$15.56	$13.15	$8.75	$0.69	$0.59	$1.01
Brazil (SC)	$15.76	$12.95	$8.01	$0.61	$0.45	$1.16
Canada	$5.63	$4.76	$3.10	$0.52	$0.52	$1.02
Average	***$33.29***	***$26.02***	***$17.47***	***$1.02***	***$1.21***	***$1.16***

*The marginal value of the incremental changes in KPI is measured as the change in profit as each KPI is changed by the increment indicated while holding all other values constant. Breed-to-wean values are reported on a per breeding female per year basis and wean-to-market values are reported on a per pig placed basis.

Appendix A. InterPig membership

InterPIG is a collaborative network involving the following organizations and countries:

- Austria – VLV Upper Austria
- Belgium – Flemish Government and Boerenbond Belgie
- Brazil (Two data sets: Mato Grosso (MT) and Santa Catarina (SC)) – Embrapa Swine and Poultry
- Canada – Canadian Pork Council
- Czech Republic – Institute of Agricultural Economics and Information (UZEI)
- Denmark – SEGES
- Finland – Atria
- France – IFIP
- Germany – Thuenen Institute and Interessengemeinschaft der Schweinehalter (ISN)
- Great Britain – Agriculture and Horticulture Development Board (AHDB)
- Hungary – AKI Research Institute of Agricultural Economics
- Ireland – Teagasc
- Italy – Research Centre for Animal Production (CRPA)
- Netherlands – Wageningen Economic Research
- Spain – SIP Consultors
- Sweden – Svenska Pig
- USA – Iowa State University and Ever.Ag

Appendix B. Breakdown of total costs by component, 2023.

Country	Fixed costs	Feed cost	Labor costs	Animal health costs	Breeding costs	Energy costs	Miscellaneous variable costs	Interest on working capital costs
Japan	5.0%	69.3%	6.3%	5.2%	1.7%	6.0%	6.4%	0.1%
South Korea	19.2%	54.8%	6.5%	7.3%	3.4%	1.4%	6.1%	1.2%
China	6.6%	76.3%	3.7%	3.5%	2.7%	1.4%	4.8%	1.1%
Vietnam	8.6%	72.6%	2.6%	3.2%	1.0%	3.2%	6.7%	2.1%
Italy	20.4%	61.6%	6.2%	2.2%	0.6%	2.6%	5.1%	1.3%
Austria	26.0%	57.1%	9.2%	3.9%	1.8%	3.0%	-2.2%	1.1%
Hungary	24.0%	54.6%	6.3%	2.7%	1.4%	3.8%	4.5%	2.7%
Ireland	14.5%	63.6%	7.2%	3.7%	2.2%	3.4%	4.3%	1.0%
Finland	20.4%	53.2%	9.0%	2.2%	2.3%	4.6%	7.0%	1.3%
Czech. Rep.	13.6%	55.8%	11.0%	4.2%	1.0%	6.2%	6.6%	1.6%
Great Britain	14.0%	65.0%	7.8%	2.0%	1.9%	2.3%	4.7%	2.2%
Germany	19.8%	61.1%	7.6%	3.6%	2.0%	2.9%	2.5%	0.6%
Sweden	19.8%	63.2%	7.8%	2.8%	2.8%	1.8%	0.9%	0.9%
France	16.4%	62.3%	7.2%	2.7%	2.4%	3.6%	4.1%	1.3%
Spain	11.4%	69.4%	5.3%	4.0%	2.4%	2.6%	3.9%	1.0%
Netherlands	16.8%	57.0%	7.2%	2.7%	2.0%	3.6%	9.7%	1.0%
Denmark	16.1%	64.0%	8.6%	3.2%	0.9%	2.6%	3.5%	1.0%
Belgium	15.0%	66.3%	7.0%	2.9%	1.8%	2.2%	3.8%	0.9%
Canada	18.6%	66.1%	5.1%	1.2%	2.5%	4.4%	0.4%	1.6%
USA	14.1%	70.5%	5.7%	3.2%	1.8%	1.9%	1.0%	1.8%
Brazil (SC)	11.9%	75.2%	3.3%	2.7%	1.2%	0.5%	2.7%	2.3%
Brazil (MT)	14.3%	71.5%	3.9%	3.5%	2.1%	1.4%	0.5%	2.6%

Appendix C. Sources of competitive advantage on a per pig sold and per female basis.

Table C1. Profit advantage of select factors, all other variables held constant, per pig sold basis, 2023.

Country	Profit advantage over average ($/pig sold)	Market pig prices	Feed prices	Productivity	Fixed costs	Labor usage	Wage rates	LaborUsage and Wage Rates
Spain	$35.30	-$10.89	$0.28	-$7.56	$7.10	$7.95	-$0.63	$4.88
Belgium	$29.85	-$43.06	$1.46	$10.21	-$0.64	$6.12	-$3.30	$1.51
Italy	$29.66	$13.75	-$5.52	-$31.80	-$12.41	-$7.08	-$0.27	-$10.71
Netherlands	$18.98	-$39.96	$4.69	$23.49	-$0.08	$8.86	-$16.95	-$0.77
Great Britain	$16.84	-$9.41	-$25.93	$6.68	$3.17	$3.09	-$2.04	-$1.26
Brazil (MT)	$16.53	-$61.76	$19.04	$16.12	$13.66	-$2.13	$17.70	$11.20
France	$15.29	-$26.15	$14.81	$7.62	$0.59	$7.91	-$8.00	$1.52
Germany	$13.55	-$41.35	$7.27	$9.79	-$12.68	$4.48	-$7.09	-$2.79
Sweden	$2.18	$23.01	$10.36	$5.94	-$18.55	$6.38	-$17.33	-$5.55
Austria	-$1.33	-$9.02	$16.14	$1.23	-$20.09	$1.63	-$4.81	-$4.99
Czech. Rep.	-$2.01	-$42.95	$19.09	$25.98	$4.80	-$10.48	$9.41	-$1.40
Denmark	-$2.63	-$22.72	$23.20	$29.12	$2.86	$7.60	-$13.88	-$1.66
South Korea	-$2.96	$224.72	-$30.85	-$49.36	-$59.26	-$3.51	-$3.59	-$10.26
Brazil (SC)	-$6.04	-$38.34	-$4.92	$15.68	$13.65	-$9.13	$18.34	$10.68
Hungary	-$9.55	-$41.46	$22.98	-$10.67	-$1.41	-$15.42	$13.92	$2.76
Ireland	-$11.54	-$13.36	-$5.59	$26.19	-$2.14	$2.90	-$1.35	-$0.99
Finland	-$11.87	-$16.90	$40.07	$17.15	-$8.41	$2.78	-$6.39	-$4.63
USA	-$13.56	-$1.32	$22.59	-$13.68	$9.69	$8.11	$2.19	$6.30
Vietnam	-$13.60	$135.71	-$75.89	-$4.02	$3.87	-$75.45	$19.71	$6.16
Japan	-$25.96	$188.95	-$95.50	-$57.42	$2.02	-$8.00	$3.73	-$6.83
Canada	-$33.27	-$11.53	$14.50	-$11.82	$15.09	$0.54	$2.30	-$0.66
China	-$43.86	$204.47	-$79.01	-$62.25	$3.77	-$16.11	$14.48	$3.40

Table C2. Profit advantage of select factors, all other variables held constant per breeding female basis 2023.

Country	Profit advantage over average ($/female/year)	Market pig prices	Feed prices	Productivity	Fixed costs	Labor usage	Wage rates	Labor Usage and Wage Rates
Belgium	$900.28	-$1,163.73	$39.43	$218.64	-$17.31	$165.51	-$89.13	$40.73
Italy	$790.31	$371.65	-$149.19	-$838.26	-$335.44	-$191.30	-$7.43	-$289.42
Spain	$777.67	-$294.21	$7.51	-$263.14	$191.79	$214.74	-$17.16	$131.78
Netherlands	$567.52	-$1,079.98	$126.63	$636.55	-$2.16	$239.42	-$458.21	-$20.88
Brazil (MT)	$433.59	-$1,669.28	$514.60	$375.21	$369.16	-$57.50	$478.37	$302.72
France	$420.24	-$706.77	$400.18	$138.71	$16.07	$213.80	-$216.16	$41.04
Great Britain	$401.93	-$254.26	-$700.77	$112.35	$85.59	$83.41	-$55.19	-$34.64
Germany	$381.88	-$1,117.53	$196.50	$202.47	-$342.62	$121.02	-$191.74	-$75.41
Sweden	$39.17	$621.84	$279.88	$91.79	-$501.46	$172.35	-$468.47	-$149.94
Austria	-$63.52	-$243.79	$436.21	-$24.25	-$542.88	$44.06	-$129.98	-$134.76
Czech. Rep.	-$76.70	-$1,160.76	$515.92	$711.60	$129.78	-$283.32	$254.33	-$37.95
Denmark	-$95.95	-$614.12	$627.06	$843.23	$77.40	$205.46	-$375.01	-$44.77
South Korea	-$103.10	$6,073.40	-$833.69	-$1,023.47	-$1,601.73	-$94.73	-$96.94	-$277.37
Brazil (SC)	-$196.92	-$1,036.21	-$133.09	$372.89	$368.88	-$246.66	$495.70	$288.70
Hungary	-$293.68	-$1,120.42	$621.12	-$415.92	-$38.00	-$416.79	$376.18	$74.56
Ireland	-$345.76	-$361.12	-$151.13	$674.14	-$57.93	$78.51	-$36.61	-$26.77
Finland	-$358.12	-$456.68	$1,083.07	$415.74	-$227.23	$75.14	-$172.78	-$125.23
Vietnam	-$373.51	$3,667.74	-$2,050.98	-$138.46	$104.47	-$2,039.17	$532.58	$166.56
USA	-$381.06	-$35.73	$610.55	-$421.60	$261.87	$219.28	$59.10	$170.27
Japan	-$679.62	$5,106.62	-$2,581.02	-$1,370.92	$54.71	-$216.34	$10073	-$184.71
Canada	-$869.47	-$311.71	$392.00	-$346.44	$407.89	$14.52	$62.12	-$17.85
China	-$875.16	$5,526.20	-$2,135.45	-$1,112.78	$101.86	-$435.31	$391.35	$91.94